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THE INDUSTRIAL PRESS PUBLISHED WEEKLY AT 100 NASSAU ST., NEW YORK

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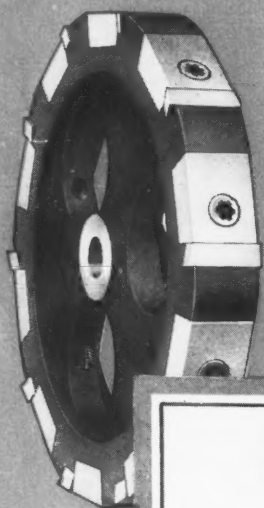
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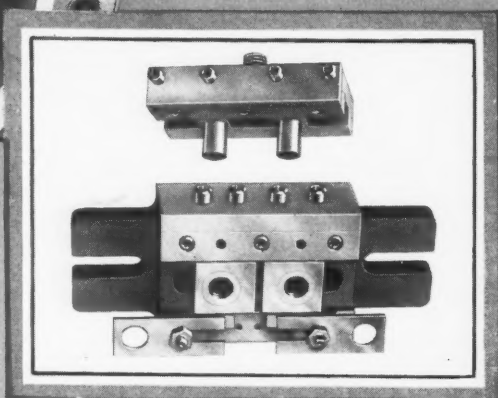
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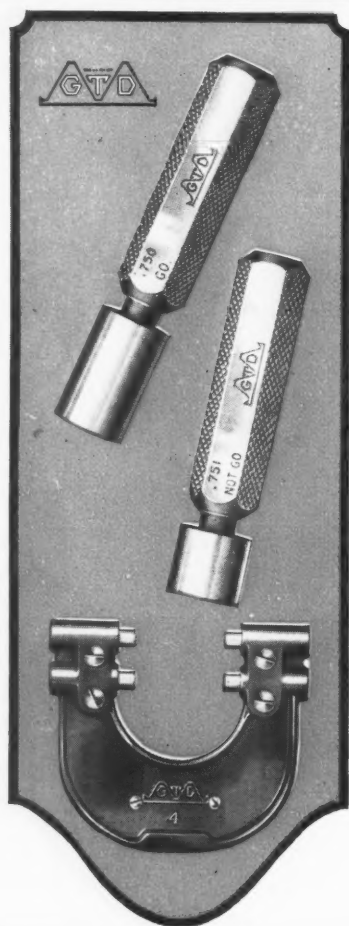
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MACHINERY

DESIGN — CONSTRUCTION — OPERATION

Volume 33

AUGUST, 1927

Number 12

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179 Exhibits

The largest exhibition ever assembled, featuring exclusively machine tools and shop accessories, will comprise the National Machine Tool Builders Exposition to be held in Cleveland during the week beginning September 19.

Works managers, superintendents and equipment engineers in every progressive plant are constantly on the lookout for whatever is new in shop equipment that will speed up production, reduce costs and improve quality. The men in those positions who hold their own in this age of intensive competition are the ones who keep posted on such developments by reading the technical journals that cover all the new designs and improvements made, by visiting other new and modern shops and by attending machine tool and shop equipment expositions, when they are held. At Cleveland they can obtain more information of this kind in less than a week than they could obtain by traveling around the country for a month.

Every progressive manager of a plant using machine tools and shop accessories should attend this exposition, and it would pay his company to send there as many as practicable of his mechanical executives who are responsible for production.

Cleveland, September 19th to 23rd.

MACHINERY

Sound Management in Dealing with Men



(Above) Present Plant of the White Motor Co.



(Left) The First Shop of the White Motor Co.

STEADY employment, good wages, good working conditions, and opportunities for self-expression, are the four cornerstones on which the White Motor Co., Cleveland, Ohio, has built a loyal organization. With this foundation for all relations with the employes, the average monthly labor turnover has been reduced to only 3 per cent, which is stated to be the lowest turnover of any industrial concern in Cleveland. The company is managed by the descendants of the founder, who endeavor to make each employe feel that he or she is a necessary member of the big White family.

By CHARLES O. HERB

Steady Employment is Provided

Manufacturers of motor buses and trucks do not experience the acute seasonal fluctuations of the pleasure car division of the automotive industry. Also, bus and truck models do not differ radically during short periods of time. For these reasons, the production of a bus and truck plant can generally be scheduled to provide practically constant employment throughout the year. It is the policy of the White Motor Co. to schedule production with the view of attaining the first cornerstone—that of steady employment.

Bonuses are Paid in Addition to Hourly Wages

One of the aims of the management is to keep the hourly wages paid shop employes as high as the wages paid for similar work in any other shop of the same industrial community; in addition, a bonus is paid to practically every shop worker. In order to make certain that the hourly wage for each job is at least as high as that paid for the same work by other concerns, inquiries are con-

stantly made by the personnel division to find out exactly what wages are being paid by other companies. The bonus paid in addition to the hourly wage is based on the skill and industry of the individual. A

definite standard of performance is set for each job after a complete time-study has been made, and the bonus depends upon the percentage of this standard which is attained by the man.

In order that there may be no misunderstanding, a combined "bonus chart and instruction card" is issued for each job. This card shows the steps into which the operation is divided, the succession in which the steps should be performed, the proper tools, feeds, and speeds to be used, and the depth of the cuts that are to be taken. The card also states the standard time per piece, the number of pieces considered as 100 per cent performance for an eight-hour day, and the amount of bonus paid for each percentage of efficiency beginning with 60 per cent of the standard.

Job and bonus classifications have been established for every job in the factory, so that the amount of bonus paid for similar jobs is identical for the same efficiency. All jobs are arranged into one of ten bonus classes, of which Class 1 pays a bonus of 25 cents for eight hours' performance at 100 per cent efficiency, and Class 10 a bonus of \$2.50. The production specified for 100 per cent performance constitutes the number of pieces that a conscientious workman can produce under good conditions without over-exertion, allowing enough time for rest and relaxation. There is no limit to the amount of bonus that a man can earn, but the company does not require him to exceed the standard performance.

In order that each man may know how much bonus he earns every day, he is given a daily pay slip for the bonus earned on the previous day. The bonus is paid on regular pay days in separate envelopes from those containing the regular wages. This practice makes the men realize that the bonus is paid for their own particular efforts and encourages saving the money earned as bonus.

Bonus is paid not only to the operators of machines on regular production, assemblers, and move material men, but also to toolmakers and men engaged in other work that varies constantly. As far as possible, bonus is also paid to office employees, such as clerks and typists. Each new hourly employee who fills his position satisfactorily receives an hourly-wage increase at the end of his first month with the company.

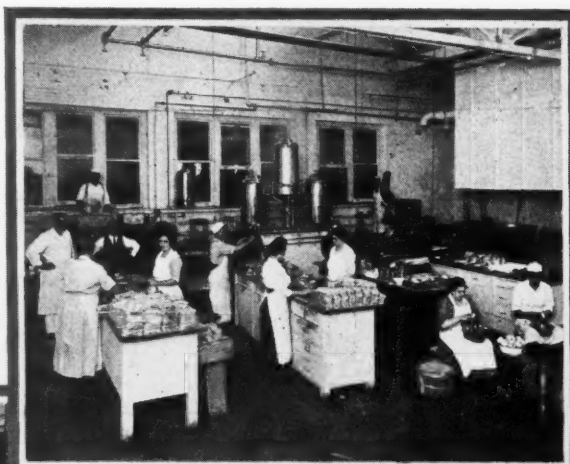
Working Conditions are Praiseworthy

A good working environment is an important

lighting system are uniformity of light, absence of glare, and elimination of almost all drop lamps at machines. All lights are cleaned periodically, since an accumulation of dust on lamps and reflectors may result in a 40 per cent loss in intensity. The installation of this lighting system several years ago has paid directly in improved quality of work and better morale of employees. The lighting system replaced would have been considered adequate by many concerns.

Locker-rooms are provided in which factory employees can wash themselves, keep their clothes, and eat their lunches. These rooms are furnished with tables and benches, and each employee is assigned a seat at a table. Through a locker-room attendant, the employees may order lunches from the factory kitchen. Lunches are obtained by the attendant and placed in the proper table locations just before the lunch period commences. Soup, sandwiches,

A Modern Kitchen Prepares Wholesome Food



The Medical Department is Completely Equipped

factor in making employees contented. For this reason, every effort is made to insure clean and sanitary conditions throughout the factory and offices. Shop men are compelled to clean their machines and the floor around them, time being allowed for this purpose. Modern safeguarded equipment is installed throughout the factory, and the most serious accident in the last five years has been the loss of a hand. This record has been attained with an average roll of 4800 employees.

The entire factory is painted both outside and inside periodically. Bright interiors are obtained by painting all inside walls and ceilings white and by washing windows and skylights frequently. Artificial lighting throughout the interior is obtained by means of 300-watt lamps spaced every ten feet apart in each direction. Clear electric light bulbs are used. Each bulb is surrounded by a glass diffusing globe and provided with an overhead white enamel reflector. Every reflector has an opening which permits a small amount of light to escape toward the ceiling.

Some of the advantages pointed out for this



A Store that Saves Money for the Employees

doughnuts, pies, milk, and coffee are sold at reasonable prices. Lunches are provided for both day- and night-shift employees. The kitchen also operates a cafeteria in which office employees, factory foremen, and others can obtain a larger variety of food. The floors and furniture of all locker-rooms are scrubbed weekly.

Smoking is not permitted in the factory departments, but the men may smoke in the main corridor, which runs the length of the entire plant, during lunch periods and before and after work. During the lunch period, a band made up wholly of employees gives a concert twice a week from an overhead platform in the main corridor and once a week in the truck erection section. This band has forty-five members, all of whom are paid for the time spent in practice. The band equipment is supplied by the company.

Bills can be Paid at Work

Many conveniences have been established that are ordinarily unknown in personnel work. For instance, there is a cashier on duty daily in an

office on the main corridor to receive money from the men to pay their personal bills for taxes, water, gas, electricity, etc. Each man is given a receipt, and the cashier is personally responsible for paying these private bills on time. Money can also be deposited in the bank through the cashier.

Assistance is frequently given by another man in the "Personnel Service Department" in making out income tax reports; applications for citizenship, automobile driving licenses, and license plates; deeds; bills of sale; etc. Legal advice can be obtained without charge from the legal department of the company, and free notary service is provided for swearing in various documents. In taking advantage of any of these opportunities, employees do not lose hourly wages.

Collections for charities, the operation of pools or lotteries, the selling of chances, etc., are prohibited, with the exception of a yearly collec-

tion made for a community fund from which contributions are made to all charitable organizations in the city. Telephone booths are established throughout the factory, from which employees can make outside calls with the permission of their foremen.

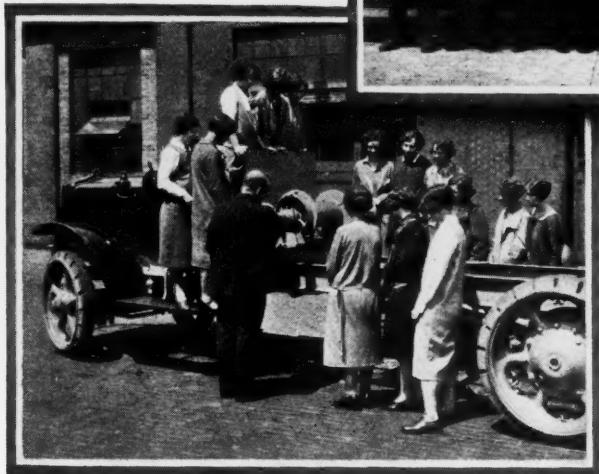
vided they remain at work. Extended treatments are given to ailing men who are able to work. Another duty of the department is to make a physical examination of every person hired and to examine from time to time all persons who have defects.

For practically every job in the factory there is a complete analysis in the medical department of the physical requirements for filling the job satisfactorily. From these analyses, the physician can readily tell whether an applicant is capable of performing the work that will be demanded of him.

When a man who has become partially disabled through accident or illness returns to work, the physician assists in placing him in a job that he is capable of filling. He also helps to place men who have become too old to continue to do the work they are engaged in.

The main advantage derived from the medical department is the saving of lost time, and the pre-

One of the Shop Committees through which Employees can Voice their Opinions



A Class of Girls Learning about the Construction of a Truck



A Branch of the Cleveland Public Library is Maintained at the Plant

tion made for a community fund from which contributions are made to all charitable organizations in the city. Telephone booths are established throughout the factory, from which employees can make outside calls with the permission of their foremen.

The Medical Department is Unusually Well Equipped

The personnel of the medical department consists of the physician in charge, five women nurses, and one male nurse, all of whom work on a full-time basis. There are also a surgeon, an internist, and an eye specialist, who serve as consultants on certain days of the week. All of the nurses are graduates and registered. The male nurse is on night duty.

The equipment of this medical department is as complete as that found in the dispensary of a modern general hospital. The department was primarily established to treat employees injured at work and cases of minor illness. However, employees injured outside of the plant are also treated, pro-

vention of premature deaths. During a recent influenza epidemic not one death occurred among White employees; credit for this record is given to the precautions taken by the medical department. During 1925, over 98 per cent of the employees did not lose any time as a result of accident or illness.

A Mutual Society Pays Sickness and Death Benefits

Every employee is encouraged to join a mutual benefit society that is operated entirely by the employees. The dues of this society average 40 cents per month per person. For the first twenty-one weeks of illness, a member receives \$12 per week from the society, and for the next twenty weeks, \$10 per week. The death benefit is \$500, of which the society pays one-half and the White Motor Co., the other half. Two men employed by the company receive the dues, pay benefits, and visit the sick.

It is interesting to note that over 75 per cent of the employees belong to the mutual benefit society. A person must work for the company one month before he can join the society; at the end of that period he receives an invitation to join. A factory

store is operated in which employes may purchase overalls, gloves, aprons, hardware, paint, sewing machines, soap, tobacco, candy, and numerous other articles.

Recreation and Means of Education are Provided

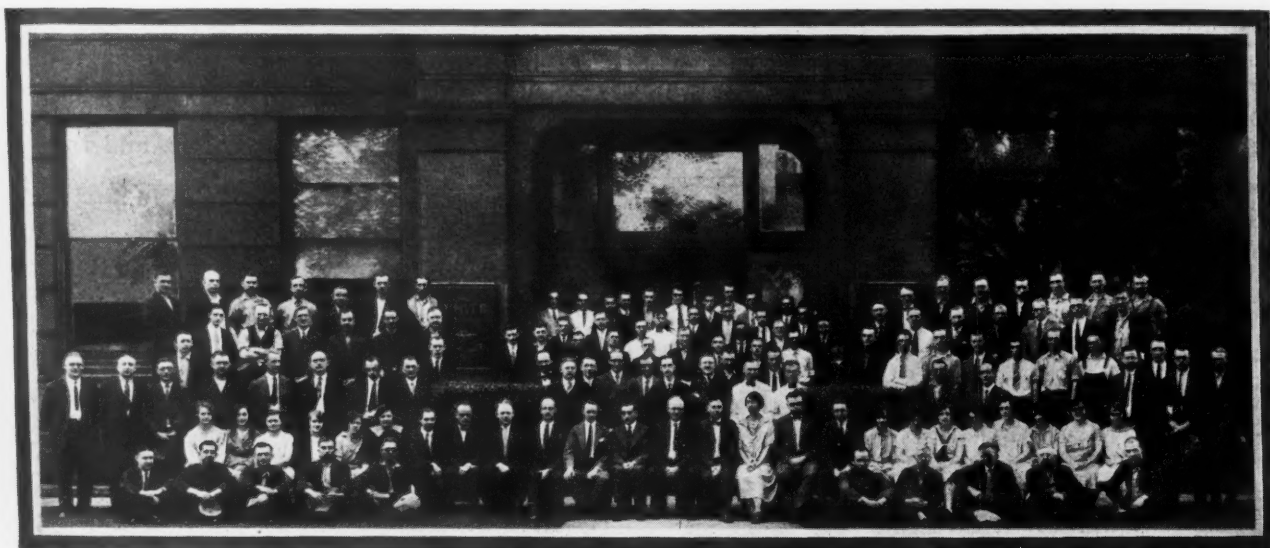
Various recreational activities are backed financially, to a certain extent, by the company. There is a baseball team which is entered in the industrial section of a city league; several indoor baseball teams; basket ball teams for men and women; and a soccer team. Bowling leagues for men and women have been established in which the various departments are represented. Every summer a big picnic is given to the White employes and their families, and every spring a party is held in the large public auditorium of the city.

A branch of the Cleveland Public Library is maintained at the plant, and through this branch,

partment for the year 1925-1926. There were 180 graduates, and of these, quite a few won certificates for more than one subject. The classes are held after working hours.

There is another form of training sponsored by the company, with a view to preparing men for the better positions which become vacant from time to time. It is the practice to select annually about fifteen graduates of various colleges, five industrious factory men, and five men recommended by the regional vice-presidents, and educate these men for White service by means of a "technical apprenticeship" course. While following this course, the apprentices work in the various departments of the shop and offices and learn from experience how trucks are built, sold, and serviced.

Examinations are held to determine which factory applicants for this course are best qualified. The college men selected are usually engineering and business administration graduates. Factory



Some of the Graduates of the Training Department Classes

an employe may obtain any book listed by the library. There are also many books of a technical nature that are owned by the company. Books of fiction and other books for personal use must be obtained outside of working hours, but the library can be visited at any time in the interests of the company. Books are exchanged daily between this branch and the main branch of the public library.

One of the important duties of the librarian is to route approximately 300 magazines per week to the various men interested in them. She also prepares a list of important articles in all the magazines and sends these lists to about 250 persons to whom the magazines are not ordinarily routed. These persons may borrow any magazine containing articles in which they are interested.

It is the policy of the company to give every employe a chance to fit himself for a better position and to promote such employes when jobs become vacant. A training department is maintained in which classes are conducted in mathematics, blueprint reading, drafting, mechanics, electricity, business English, industrial psychology, industrial management, public speaking, and other subjects. Classes are open to both men and women. One of the illustrations shows a typical class group, while another shows the graduates of the training de-

men who complete this course are generally given semi-supervisory positions in the manufacturing departments, whereas the others are generally placed in various divisions of the manufacturing, sales, and service organization.

Employes can Express Their Opinions

Opportunities for self-expression—the fourth cornerstone of the White organization—are afforded through two principal mediums. The more important of these consists of committees representing every department of the factory. There is a committee member for every ten men in a department, these members being elected by secret ballot for terms of six months.

Each shop committee meets regularly twice a month to take action on any matters that have been brought to the attention of the members by their fellow workmen or to discuss communications received from the management. There are no restrictions as to the subjects that may be discussed. Minutes are prepared by a secretary, typed copies of which are sent to the management and posted in the departments concerned. The management replies to all matters called to its attention. Executives often address the shop committees to explain reasons for improvements and changes that affect

the employees. These shop committees meet on the company's time.

The second important medium is "The White-Book," a monthly magazine devoted entirely to subjects of interest to the employees. Everyone is urged to contribute articles or news items. This magazine is mailed to the homes of the employees and no one but an employee can be placed on the mailing list.

Personnel Work has Paid

Men are able to earn more money when physically fit, when freed from small worries and certain personal duties, and when interested socially as well as industrially in the affairs of the plant in which they are employed. It is for this reason that the White Motor Co. maintains the various activ-

objects of paternalism. The actual cost to the company of the various activities outlined is low per employee, and this is explained to them, but it is also pointed out that if the employees were to purchase only a few of the privileges individually, the cost per person would be a great deal higher. The fact is always emphasized that the company derives advantages from the personnel work, as well as the employees.

* * *

CENTER OF THE MACHINE TOOL INDUSTRY

An article of interest to users and builders of machine tools alike will be published in September MACHINERY on the machine tool industry in the United States. This article gives a brief historical review of the development of this basic industry,



Two "Old-timers" in the Service of the White Motor Co., Michael Petronek and John Zaugg, Each Having Served Over Thirty Years



ities outlined in this article. The advantages accruing to the company have been increased production, improved quality of product, and a loyal organization. Over 25 per cent of the employees have been with the concern between five and ten years, and quite a few have been there since the company was established.

Two "old-timers" are shown in the illustrations; these men worked for the White interests when only sewing machines were being built and when the small building seen in the insert of the heading illustration provided sufficient floor space for the business. Michael Petronek has been an employee for over thirty-one years, and John Zaugg, is a "thirty-two-year" man. These men have seen the business of the concern grow and prosper until it required the construction of the large well-equipped plant shown in the main portion of the heading illustration.

Every effort is made by the officers of the company to prevent employees from feeling that they are

together with maps and tables relating to the production of machine tools in different states and cities. The machine tool industry, which was at first located entirely in the extreme east, has gradually expanded westward. A brief review of this westward movement is of especial interest, because it is also an indication of the westward movement of the machine-building and metal-working industries as a whole. The article briefly reviews this westward movement, and presents statistics of the growth of the industry and of its present state of development. It also locates—approximately at least—the center of the machine tool industry, somewhat in the same way as the center of population is located each ten years by the United States Bureau of Census. At some point, an imaginary line may be drawn north and south through the United States. East of this line one-half of the machine tools built in this country are made, and west of it the other half are produced. The article shows how this line may be located.

Ingenious Mechanical Movements

AUTOMATIC COIL-WINDING MACHINES

By D. L. ROBERTS

A coil-winding machine of simple but ingenious construction is shown by the plan view Fig. 1. This machine can be adapted to radio transformer windings, tapped coils, charger winding, and to practically all forms of coil windings containing the smaller sizes of wire. For the larger sizes, the machine illustrated in Fig. 2, which is to be described later, is preferable. The machine shown in Fig. 1 may be stopped automatically (a) for taps, (b) at the end of the coil, (c) if the wire should break, and (d) when the wire supply spool is empty. Each stop is accompanied by the ringing

of an electric bell, which notifies the operator that the machine is idle.

General Principle of Operation

The loose pulley *A* drives, through clutch *B*, the main shaft *C* and the winding arbor *D*. The small pulley *E*, which guides the wire, and its supporting slide are traversed at a uniform rate to the right by cam *F*, which is revolved through worm-gearing *G* from the main shaft *C*. Cam *F* acts against pin *H*, and the guide pulley and its slide are returned at a uniform rate, because spring *J* holds pin *H* in contact with the cam.

Shaft *C* also drives, through bevel gearing *K* and worm-gearing *L*, stop-cam *M*. Plunger *N* is held

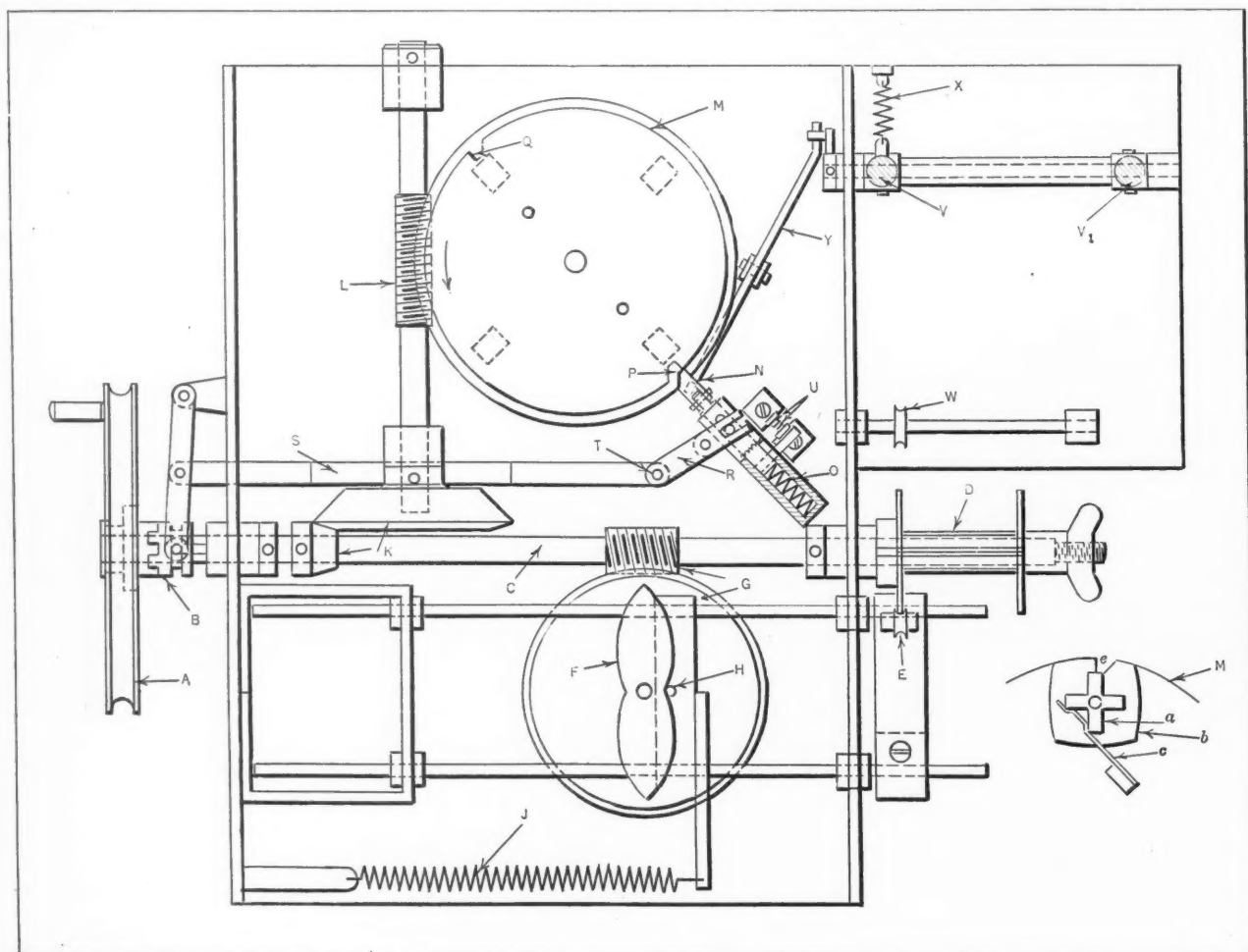


Fig. 1. Coil-winding Machine which Stops Automatically (a) for Taps, (b) at End of Coil, (c) if Wire Should Break, and (d) when Wire Supply Spool is Empty

against the edge of this cam by spring *O*. To provide automatic stops (a) for taps, and (b) for the end of the coil, notches as at *P* and *Q* are cut into the edge of the cam, and as plunger *N* is forced horizontally into a notch by spring *O*, clutch *B* is disengaged through the action of the links *R* and *S*. At the same time, an extension on plunger *N* closes contacts *U*, thus ringing the electric bell. A starting lever can be connected at *T*, or at any other convenient point.

A vertical U-shaped frame extends upward at *V* and *V*₁. This frame supports the supply spool. Provision is made for varying the tension on the wire which runs from the spool under pulley *W* (which is free to slide on its support) around guide pulley *E* to the arbor *D*. Tension on the wire holds

the worm-gearing at *G* should consist of a single-thread worm and a wheel having 95 teeth.

The number of notches and their location in stop-cam *M* may, of course, be varied to suit the winding operation, and the gear ratios are also varied as required. If more than 1000 turns were required between stops, the prolonged action could be obtained without increasing the ratio of 1000 to 1 between shaft *C* and stop-cam *M* by employing the star-wheel mechanism shown by the detail view in the lower right-hand corner of the illustration. This star-wheel is mounted on cam *M* adjacent to one notch, and the function of this particular design is to close the notch against the entrance of plunger *N*, except during every fourth stop-cam revolution.

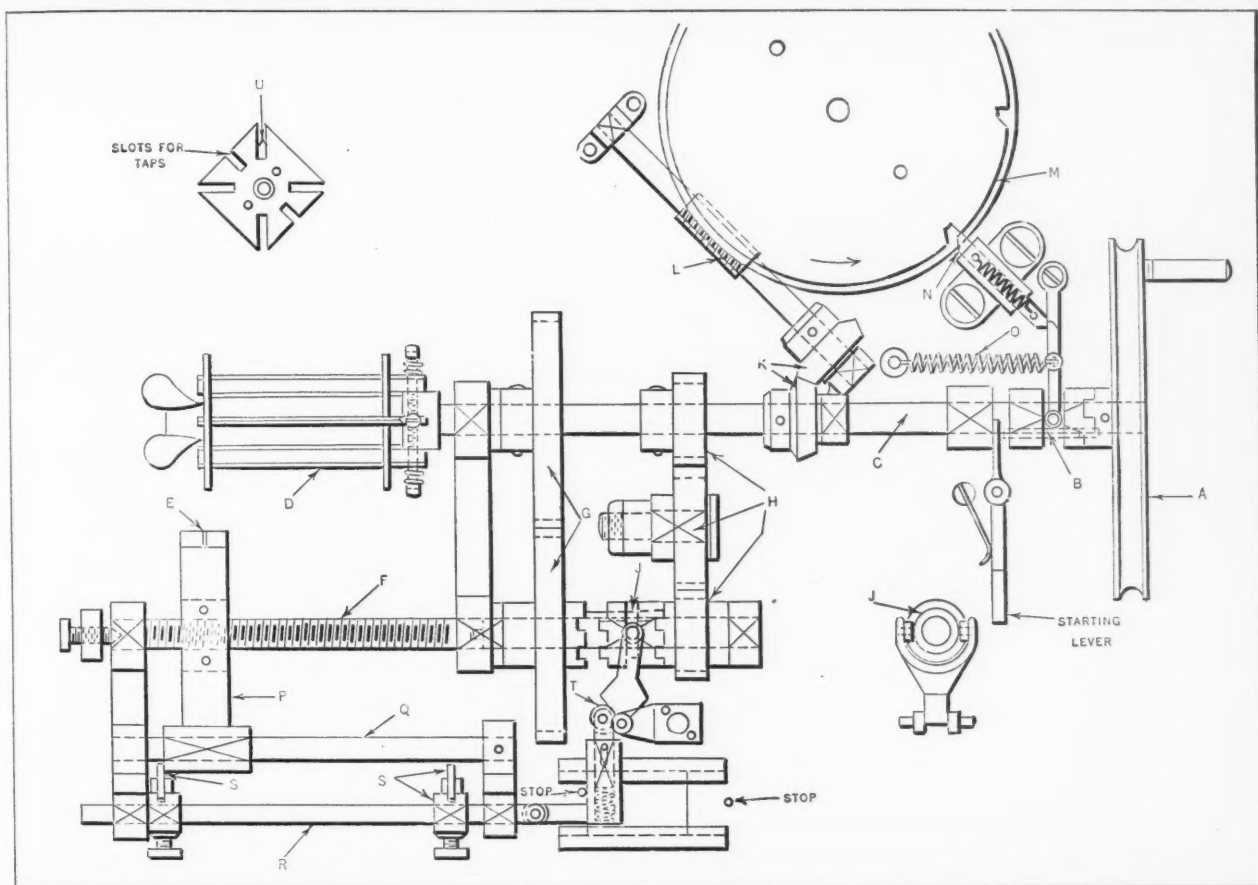


Fig. 2. Another Automatic Coil-winding Machine Intended for Heavier Wire than Machine Shown in Fig. 1

the spool frame forward against a stop. If the wire breaks, spring *X* pulls the frame backward, and through the crank extension and pivoted lever *Y*, stop-plunger *N* is thrust upward out of contact with cam *M*, thus releasing clutch *B*, stopping the machine, and ringing the bell.

Arrangement of Mechanism to Suit Different Requirements

It will be evident that the action of this machine may be varied as required by changing the gear ratios and the notches in the stop-cam *M*. The particular machine illustrated has a bevel gear ratio at *K* of 4 to 1, and a ratio of 250 to 1 at *L*; hence, the stop-cam *M* makes one revolution for every 1000 revolutions of the driving pulley *A*. Since there are two notches in cam *M* diametrically opposite each other, the machine with this particular arrangement will stop after every 500 revolutions of the main shaft *C*. For winding ordinary coils,

The star-wheel *a* is attached to a plate *b*, the curved edges of which coincide with the edge of the cam. The star-wheel is held in one of its four positions by spring *c*, and wheel *a* and plate *b* are turned about a common center (by engagement with a suitable star-feed pin not shown) one-fourth revolution for each revolution of the stop-cam *M*. When the notch in plate *b* coincides with the notch in cam *M*, as at *e*, stop-plunger *N* is allowed to act. With the particular arrangement shown, however, the following three turns will successively present blank sides of plate *b* opposite the notch and close it so that plunger *N* cannot enter. Consequently, the machine will stop after every 4000 revolutions of the main shaft. This arrangement, however, can be modified in various ways to meet all requirements.

In winding spark coils, radio transformer coils, etc., it is often desirable to stop the winding after every layer of wire, regardless of the number of

turns, in order to insert silk or wax paper insulation. Such a requirement can be cared for easily by employing a lever which acts upon plunger *N*, similar to lever *Y*. This additional lever should be so mounted that it will disengage plunger *N* from the cam when contact is made with extensions on the under side of the slide supporting guide spool *E*. This contacting end of the lever should have an adjustment to suit the width of the coil, so that the horizontal travel of the guide spool and slide is a controlling factor in timing the stop. Such an arrangement will provide accurate layer stops.

The illustration, which is partly diagrammatic, shows the worm-wheel at *G* and the traversing mechanism in the wrong position so as to clearly illustrate its arrangement in a single drawing. As actually constructed, this part of the mechanism is located at an angle of 45 degrees, so that there is no interference between arbor *D* and the guide spool *E* and its slide, as might be inferred from this illustration.

To lay out cam *F*, first determine the pitch of the coil winding; then thread two sleeves of corresponding pitch—one right-hand and the other left-hand. Place one of these sleeves in the position occupied by arbor *D*, and at *E* attach a half-nut to engage this threaded sleeve. Locate a scribe on the cross-bar which holds pin *H*, and place the point in contact with the cam blank, which, of course, is mounted on the camshaft. By traversing the half-nut from left to right, two cam curves on opposite sides and opposite ends will be laid out. The other threaded sleeve is then used to produce the two remaining cam curves.

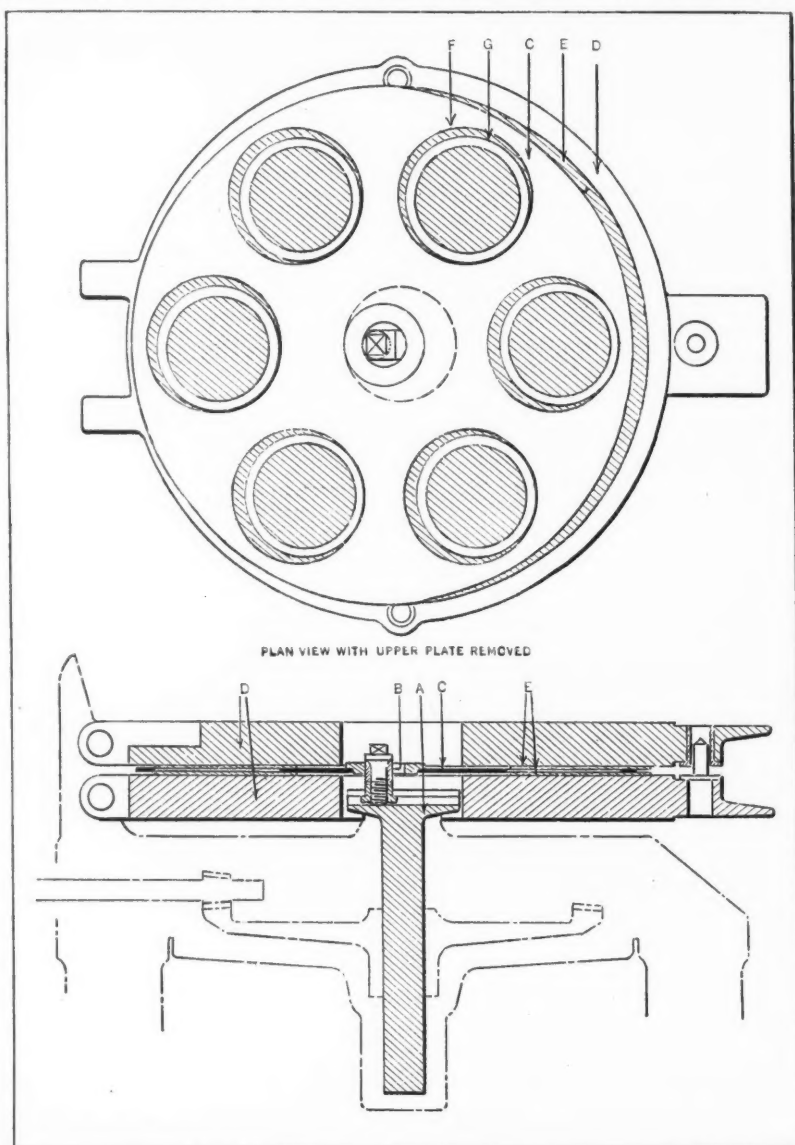
Coil-winding Machine for Heavier Wire

The coil-winding machine shown in Fig. 2, which is for heavier wire than the one just described, is driven by pulley *A* which connects with the main shaft *C* through clutch *B*. A stop-cam *M*, driven through bevel gears *K* and worm-gearing *L*, automatically controls the disengagement of clutch *B* when plunger *N* enters a cam notch, thus releasing the clutch lever, which is swung to the left by spring *O*. This part of the mechanism is quite similar in principle to that previously described in connection with Fig. 1. The mechanism for traversing the wire along the winding arbor, however, is entirely different. Instead of using a cam, a reversing lead-screw *F* is employed. This lead-screw is revolved in one direction through the two spur gears *G*, and in the opposite direction through three gears *H*. The reversal of rotation at each end of the coil is obtained by shifting clutch *J*.

The coil is wound on arbor *D*, the wire passing through guide notch *E* in the end of slide *P*, which has a half-nut engaging lead-screw *F* and a bearing on rod *Q*. Screw *F* and the half-nut correspond to the desired pitch of the coil. At the limit of its

travel, slide *P* engages stops *S*, thus shifting rod *R* and clutch *J* through a load-and-fire mechanism at *T*.

The winding arbor *D* (see detailed end view above it) is so constructed that when the end plate is removed, four rectangular supporting pieces, as at *U*, will collapse slightly to free the coil, these pieces being attached at the rear by screws and compression springs. This general type of arbor is also used on the machine shown in Fig. 1. The notches in cam *M* are, of course, laid out to suit the work. This particular cam is 1/8 inch thick,



Mechanical Lapping Mechanism for Finishing Small Brass Rings

and it is centered and driven by pins projecting from the worm-gear. This machine will wind coils made of the larger sizes of wire in a very satisfactory manner.

* * *

MECHANICAL LAPPING MECHANISM FOR PLANE SURFACES

By W. C. LANDIS

An ingenious mechanism, to be useful, must be practicable. To be practicable, it must perform a necessary function in such a way as to reduce net cost, or improve quality within profit-returning limits, or both. The illustration shows such a device. From this mechanism are obtained the me-

chanical movements required in accurately lapping the parallel surfaces of small brass rings. The success of this mechanical lapping process is indicated by the fact that a trial extending over five years has shown that one man with one machine can easily lap 2500 rings a day to within 0.0002 inch of parallelism.

Referring to the illustration, a vertical shaft *A* is rotated at 150 revolutions per minute. An adjustable eccentrically located roller *B* on the upper end of the shaft engages a hole in a driving disk *C*, the hole being about half again as large as the roller. Thus the disk is oscillated in a horizontal plane 150 times a minute. As the roller is smaller than the hole in the disk, and therefore assumes a position eccentric to the disk, and as the point of eccentricity is continuously progressing around the circle, due to the inertia of the unequally divided mass of the disk, the disk itself assumes a slow motion of rotation.

The driving disk oscillates and rotates between two plates *D*, which are nominally stationary, but which have a certain amount of freedom in all directions. These plates are covered, on adjacent faces, with disks of abrasive cloth *E*. The driving disk has openings *F* cut in it to receive the rings *G*, these openings being on a circle which is of the same diameter as the mean diameter of the abrasive disks.

When the roller is adjusted to the proper eccentricity for the size of the rings, the oscillation of the driving disk will pass the rings over the outside and inside edges of the abrasive disks an equal amount. The openings in the driving disk are a little larger than the rings, so that the latter are free to rotate around their own centers. They do this because the path around the plates, of any points on the outside edges of the rings, is greater than that of any points on their inside edges; therefore the lapping action is equalized as the rings twist around their own centers.

Thus, by an ingenious adaptation, a simple crank translates to a number of work-pieces, at one time, an oscillatory motion, as well as motions of rotation around both their individual and common centers, and a complication of mechanical movements is obtained, without precise construction or skilled attention, which produces precision results. This lapping mechanism is practicable, because it superseded a costly manual operation by a device that is relatively inexpensive to build, operate, and maintain, and because the accuracy of its work is governed mechanically and not by the limitations of human skill.

* * *

FLUID GAGE FOR TESTING CONCENTRICITY OF PISTON CASTINGS

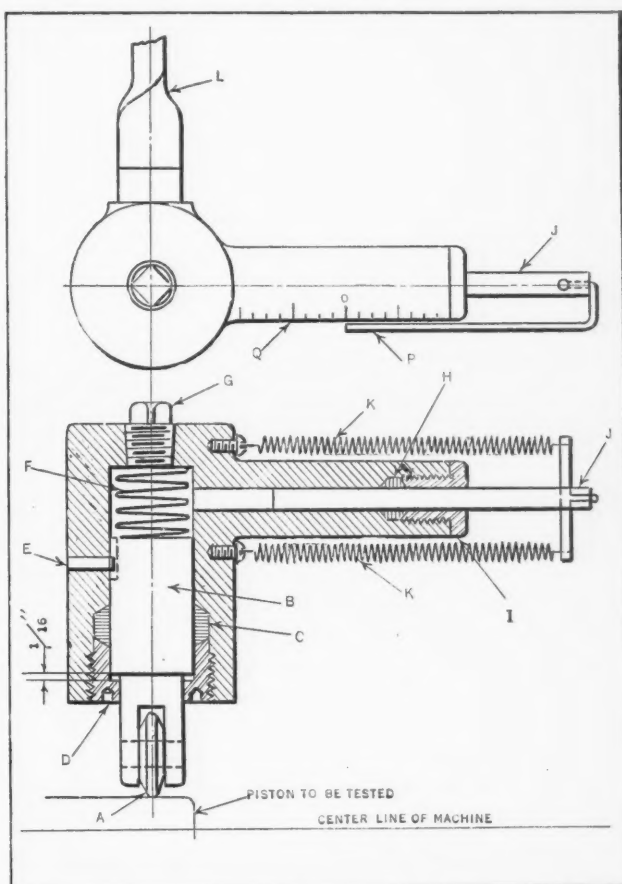
By CHARLES F. STEIN

Rough pistons from the foundry are often so much out of round that when turned and ground, the walls are thin on one side and heavy on the other. This trouble led to the development of the fluid gage shown in the accompanying illustration, which was attached to the machine employed for the first rough-turning operation. Each piston, before being turned, is tested with this gage, and if too much out of round it is scrapped, thus elim-

inating useless labor and assuring that every piston that goes into the motor is of uniform strength and weight.

Referring to the illustration, roller *A* is a running fit on the pin held in the projecting end of plunger *B*. This roller serves as the contact point on the piston casting to be tested. The felt packing *C*, which gives an oil-tight fit between the cylinder and plunger *B*, is held in place by the nut *D*. A small pin at *E* projects into a keyway in the plunger, and keeps the latter member from turning in the cylinder; this arrangement keeps the roller *A* in a plane at right angles with the axis of the work.

A spring *F* serves to keep the roller in contact with the work. The oil is placed in the cylinder



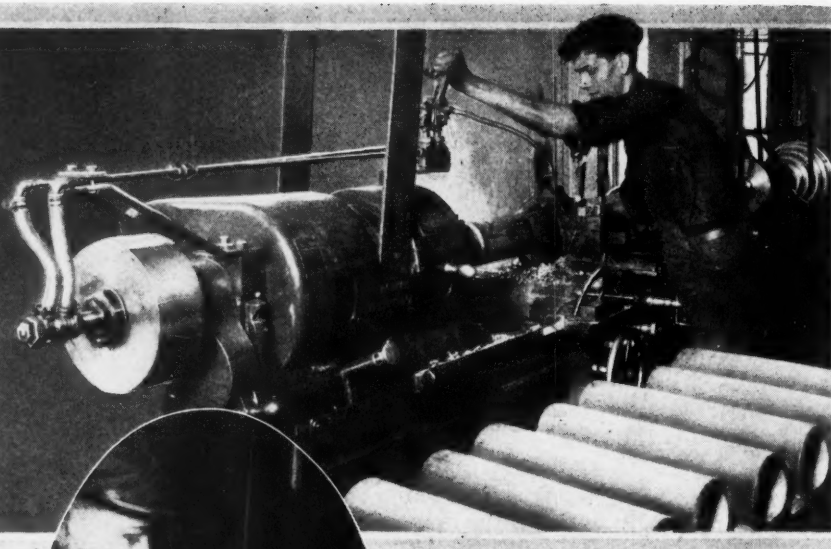
Gage for Testing Concentricity of Piston Castings

through an opening which is closed by the threaded pipe plug *G*. The packing *H* and nut *I* provide an oil-tight fit for the indicating plunger *J*, which is held in position by means of the two light coil springs *K*.

The gage is held in place by arm *L*, which is attached to the machine and allows the gage to be thrown back out of the way while the piston is being machined. When the gage is thrown into the position shown, roller *A* rides on the piston. Any eccentricity or raised portions on the casting will force plunger *B* upward and compress the oil in the cylinder forcing it to act against the plunger *J*. As the oil displacement of plunger *B* is fifteen times as great as that of plunger *J*, a run-out of 0.010 inch in the piston casting will cause plunger *J* to move outward $\frac{5}{32}$ inch. The pointer *P*, which is attached to the end of plunger *J*, indicates on the scale *Q* the amount that the casting is out of round.

Air Chucks and Fixtures

Pneumatically Operated Equipment Designed to Save Time and Labor in Quantity Production



AIR-OPERATED equipment has been produced by the Hannifin Mfg. Co., Chicago, Ill., for installation on many different types of machine tools. In Fig. 1 is shown a three-jaw chuck built for use on a vertical turret lathe. It will be seen that the chuck body *A* is fastened to a plate *B* which, in turn, is mounted on the head of an air cylinder *C*. The cylinder casting is bolted to the table of the machine. Air for raising piston *D* within the cylinder is delivered through pipe *E* and port holes in piston-rod *G*, whereas air for lowering the piston is delivered through the internal pipe *F* and port holes in the piston-rod.

The chuck body is provided with three sliding jaws *H* which may be equipped with false gripping jaws of any shape to suit the work. For gripping the work, air is admitted into the cylinder to force piston *D* downward. As this occurs, spool *J* is pulled downward by the piston-rod, which causes three bellcrank levers *K* to swivel, thus drawing the three jaws *H* toward the center of the chuck. When air is admitted into the cylinder beneath the piston, the mechanism functions in the reverse manner, moving the jaws out and releasing the work.

One of the features of this chuck is an adjustment by means of which the movement of the jaws can be closely regulated to suit the diameter of the work. This is effected by screwing spool *J* on or off the piston-rod, by means of a spanner wrench, thus changing the positions of the bellcrank levers, and their



respective jaws, relative to the upper and lower positions of the piston. Each jaw is also furnished with a screw adjustment *L* for varying the position of the jaw on its slide. Pipes *E* and *F* extend from the machine foundation through the table spindle.

Lathe Chuck of Pull-back Design

Two different parts may be held in the lathe chuck illustrated in Fig. 2 through the provision of

two pilot plates *A* and *B*. These plates are employed for holding pieces *X* and *Y*, respectively. Either of the plates may be assembled to chuck body *C*, and slots are provided in the plates to receive two hinged jaws *D*, which extend in front of the assembled plate, as illustrated. The hinged ends of the two jaws are connected to a socket plate *E*, which is operated horizontally by the head of bar *F*, the rear end of this bar being connected to the piston of the air cylinder.

In the illustration, the full lines show the chuck mechanism drawn back to grip the work. When the operation has been completed, air is admitted into the cylinder to force the piston-rod forward; this, in turn, moves socket plate *E* forward, carry-

ing jaws *D* with it until the front side of the jaws reaches the position shown by dotted lines *Z*. The finished work may now be slipped from pilot plate *A* and a new piece substituted. Air is then admitted into the cylinder on the front side of the piston to pull back jaws *D*, so as to grip a new piece of work.

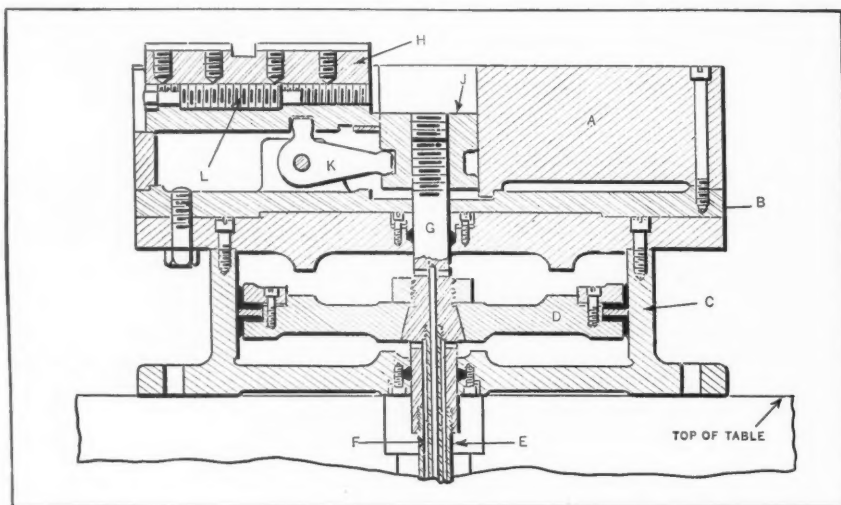


Fig. 1. Air-operated Chuck Designed for Installation on a Vertical Turret Lathe

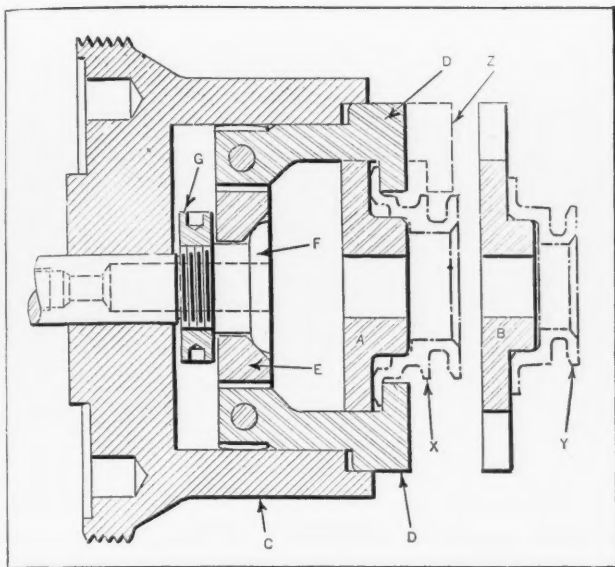


Fig. 2. Lathe Chuck Designed for Holding Two Different Parts

The hinged jaws *D* come in contact with the inside of the chuck body and, therefore, again swivel. Socket plate *E* is free to swivel an amount limited by the position of nut *G* on bar *F*. Because of this construction, jaws *D* can position themselves in and out to compensate for variations in the thickness of the flange gripped and thus insure an equal pressure around the work.

Bellcrank Lever Chuck for Holding Forgings

Fig. 3 shows a lathe chuck of standard Hannifin design, with the exception that jaws *A* are provided with special false jaws *B*. These false jaws are designed to seat the flange of the work firmly against a ledge on the jaws at the same time that the jaws are moved radially to grip the flange. The chuck is of the three-jaw type. Spindle *C* is connected to the air piston, and moves toward the left to operate three bellcrank levers *D*, which tighten the jaws on the work. Obviously, the spindle is moved in the opposite direction to release the jaws.

Equipment for Cutting Helical Grooves

Helical grooves are cut in eight holes in automobile valve tappet guides by means of the equipment

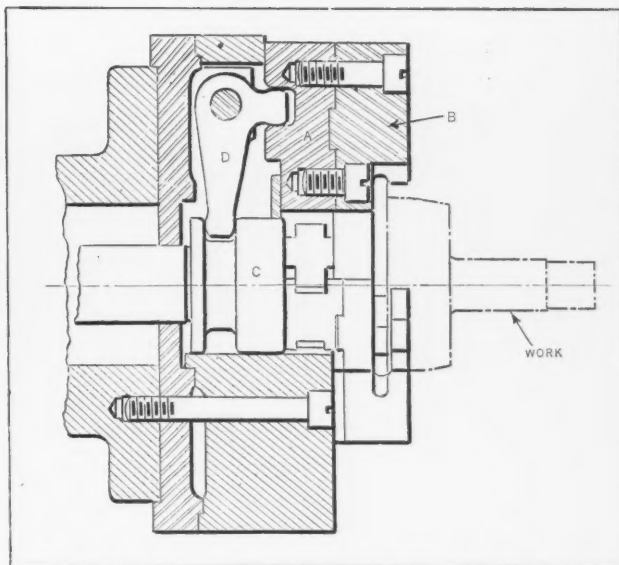


Fig. 3. Another Chuck Operated on the Bellcrank Lever Principle

illustrated in Fig. 5. For the operation, the guide castings are slipped between two ground plates held in block *A*, which is fastened to the table of an arbor press. A groove is cut in each hole in the work as the tool contained in bar *B* is successively fed through the holes. Bar *B* is fed downward by exerting pressure on spindle *C* through the regular arbor *D* of the machine.

There is a groove machined in the lower end of spindle *C*, which is engaged by key *E*, with the result that the spindle and bar *B* are rotated according to the lead of the groove, at the same time that they are lowered. In this way, the groove in each hole of the tappet guide is produced at the proper lead. The connection member between spindle *C* and arbor *D* is equipped with a ball bearing to permit free rotation of the spindle relative to the arbor. As bar *B* passes through the hole in the lower part of block *A*, it is released from spindle *C* so as to avoid the necessity of feeding the tool slowly back through the groove produced. The bar is then replaced in spindle *C*, the work shifted to bring the next hole beneath the bar, and the operation continued as before.

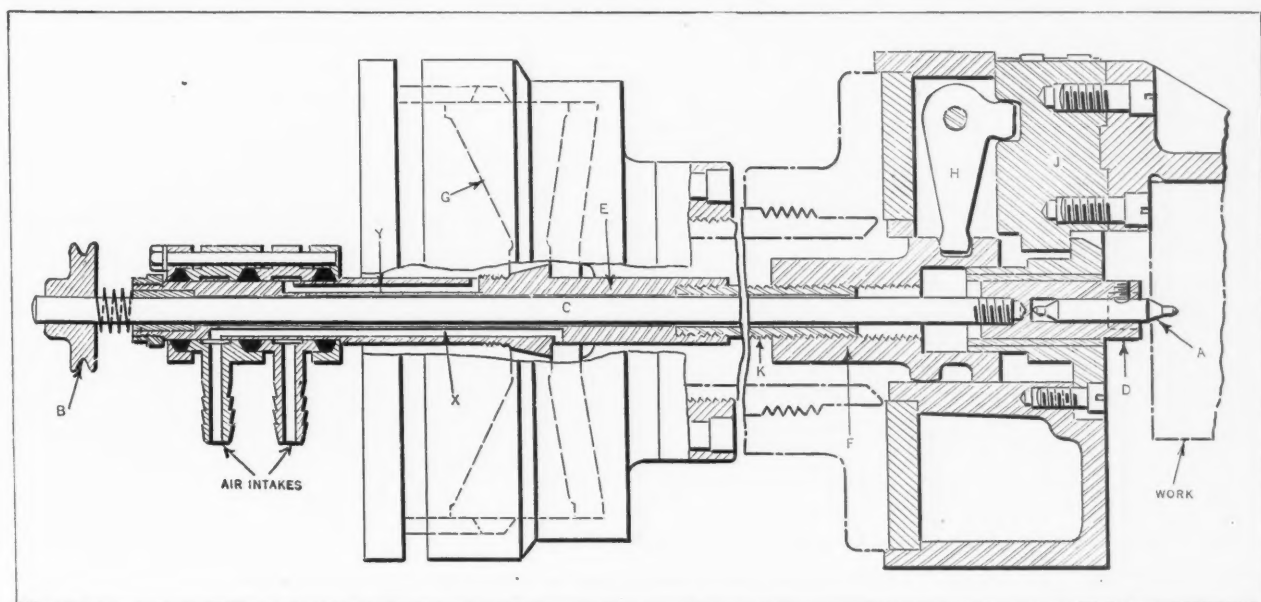


Fig. 4. Chuck that Permits Pistons to be Center-drilled and Countersunk during a Standard Lathe Operation

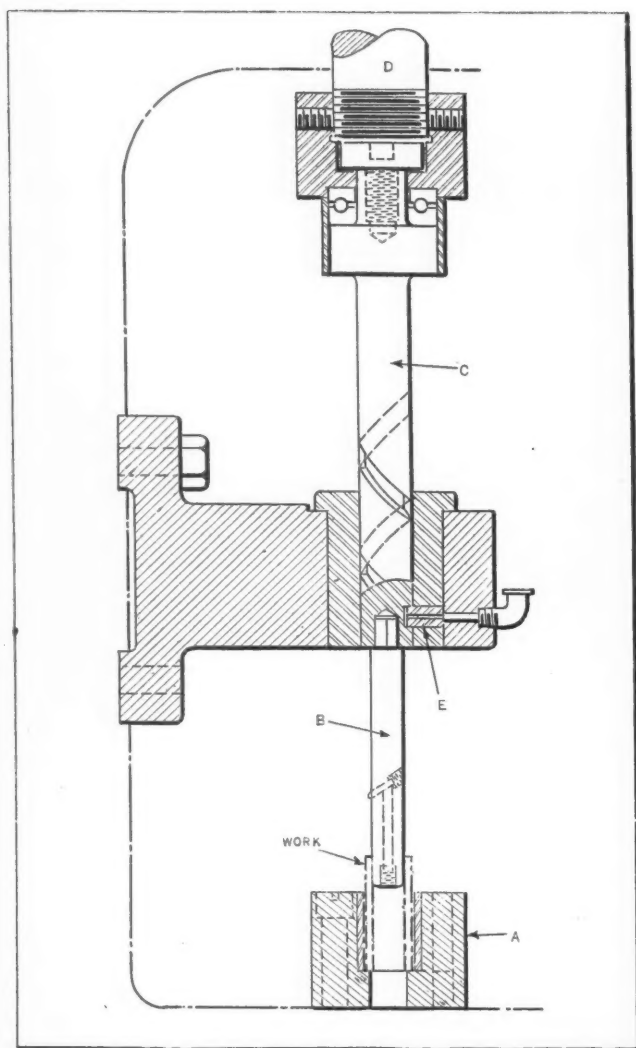


Fig. 5. Equipment for Producing Oil-grooves in Automobile Valve Tappet Guides

Chuck with Provision for Center-drilling and Countersinking

While various cuts are being taken on the skirt end of automobile pistons held in the chuck illustrated in Fig. 4, the closed end is center-drilled and countersunk by means of tool A. This tool is fed to the work, while the regular lathe operation is in progress, by simply moving the small pulley B horizontally by means of a shifter lever. This sidewise movement of the pulley actuates rod C and holder D in which the tool is mounted. It will be obvious that rod C extends through the hollow piston-rod E.

The work is gripped in the chuck when air is admitted into the cylinder through port X, forcing piston G toward the left. This movement is transmitted through the piston-rod and connection K to sleeve F, causing bellcrank levers H to swivel and draw the three jaws J and their false jaws toward the center of the chuck. Air is admitted into the cylinder through port Y to force the piston forward for releasing the work. The chuck, cylinder, and piston are standard equipment.

Lathe Chuck for Differential Spiders

Fig. 6 shows a chuck of unusual design, which was developed for holding differential spiders in a lathe. The construction of the chuck is such that the two arms of the spider can be turned successively. For the operation, the previously reamed bore of the spider is slipped over member A, which contains four jaws that can be expanded radially by pulling wedge B into member A. The arm of the spider opposite the arm that is to be turned, is located by means of the V-end of bar C. This bar is connected through rod D to the piston-rod extending from the air cylinder. A Woodruff key contained in sleeve E prevents bar C from turning. Sleeve E is attached to the cylinder by means of tube F.

The air cylinder provided for this chuck is of floating design. When air is admitted into the cylinder for gripping the work in the chuck, the piston, rod D, and bar C are pushed toward the right, causing bar C to exert pressure on the adjacent arm of the differential spider. At the same time, the cylinder, tube F, and sleeve E are moved toward the left, carrying bolt G with them. The forward end of this bolt is wedge-shaped and is assembled in a slot in the post H. Hence, as bolt G is pulled toward the left, post H is pulled radially from the center of the chuck and tightens wedge B in member A, expanding the four jaws of member A against the finished bore of the spider.

When air is admitted into the cylinder on the front side of the piston, bar C is pulled back, releasing the arm of the spider that has been machined, and bolt G moves forward to return post H toward the center of the chuck and thus push wedge B out of member A. The four jaws of member A are then contracted through the action of four coil springs. Both arms of the differential spider can be machined by shifting their positions between operations.

* * *

A bulletin on stainless steel, known as Engineering Research Publication No. 4, has been published by the Department of Engineering Research of the University of Michigan, Ann Arbor, Mich. It contains information on the history, properties and uses of stainless steel, as well as a bibliography.

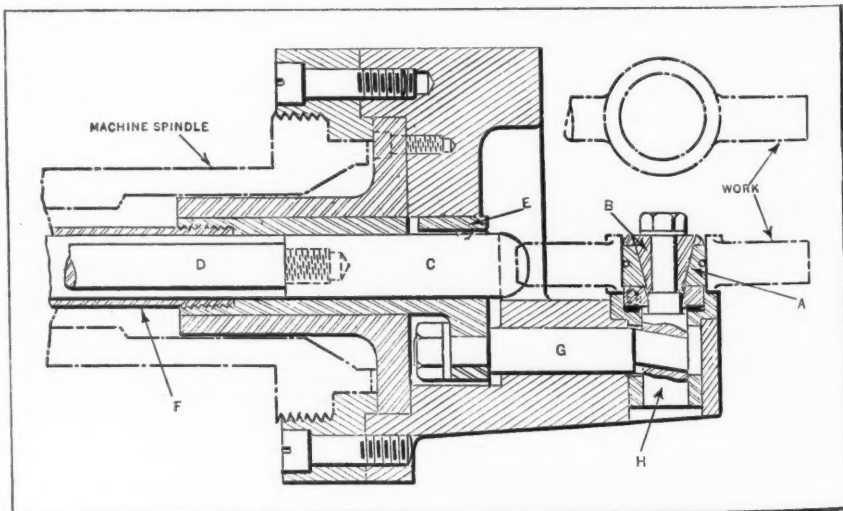


Fig. 6. Unusual Chuck Construction for Holding Differential Spiders in a Lathe Operation

Net Profits from Small-lot Production

A Study of the Savings Due to Improved Equipment and Methods

By W. J. BURGER, Works Manager, Warner & Swasey Co., Cleveland, Ohio

THE problems of small-lot production are entirely different from those of quantity production. When only five to thirty-five pieces of a kind are made at one time, the problem becomes one of lowering costs without elaborate equipment. The profits from small-lot production are often exceedingly slim, because parts made in small lots compete with those made in quantity. The intensive methods of the quantity producer are

The results are as follows: (1) On bar jobs, the average saving by the new methods was 54.4 per cent of the production time, including the set-up. (2) On chucking work the average saving was 59.8 per cent of the former production time. (3) On all the work, both bar and chucking together, the average saving was 58.8 per cent. In other words, a study of over one-hundred small-lot installations of modern turret lathes for making five to thirty-five

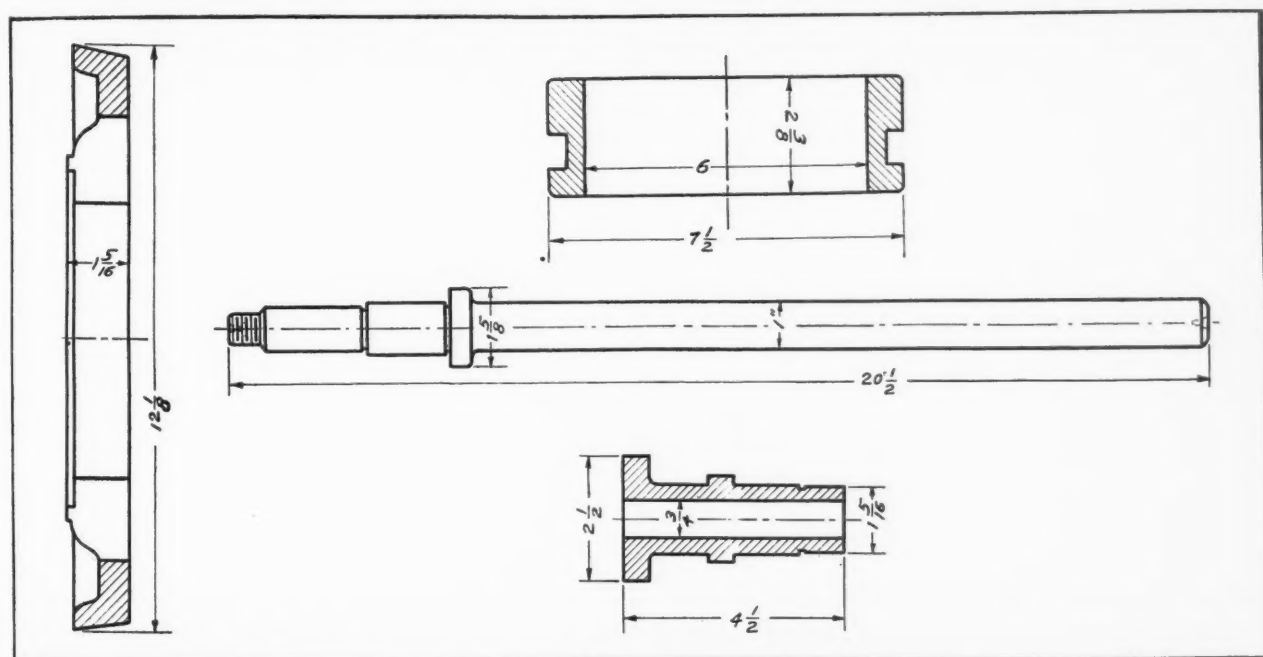


Fig. 1. Illustration Showing the Range of Work Handled in the First Machine Installed in the Plant, the Production of which is Studied in this Article

impossible under small-lot conditions, yet many manufacturers have succeeded in making profits from small lots. In proof of this, a study has been conducted over a two-year period of the actual results from the installation of modern machine tool equipment for small-lot work. Over one hundred installations have been studied and the facts gathered relating to production time under former methods and under present methods. In the cases studied, modern turret lathes are the machines used by present methods.

No attempt has been made to select unusually favorable cases, and all the examples studied are included in the summary of the average results which follows. The work studied ranges from 1/2-inch bar work to 22 1/2-inch chucking work. The machines range in size from the turret lathes commonly called No. 4 and No. 6 to the No. 1-A, 2-A, and 3-A machines. The figures for the turret lathe time in each case include the set-up as reported. The parts covered by this comprehensive study were made from a variety of metals, such as cast iron, bar steel, forgings, and bronze.

pieces in a lot shows that the time is more than cut in half by the use of the latest equipment.

The Three Reasons for Net Profits

A study of this large number of installations shows clearly that there are three reasons for the production savings. Let us first examine the reasons and then find by actual examination which types of work show small savings and which types show very large savings. These reasons are mainly: (1) Combined cuts—taking cuts from both the square turret station and the hexagon turret station at the same time. (2) Multiple cuts—replacing single cuts from one of the tool stations with two, three, or more cuts from the same tool station. (3) Power and rigidity—providing rigid machine and tooling which will permit heavy feeds without destroying the accuracy required; rigidity does not necessarily mean weight, but means machine tool equipment designed with the metal in the proper places; a machine designed in this manner has the required rigidity, but still is not cumbersome to operate.

The individual items in this list range in savings from 25 to 82 per cent. The small savings are usually found on work that is very simple in nature and put through in very small lots. The savings, running from 60 to 82 per cent, are found on work where it is possible to apply all three of the principles stated, combined cuts, multiple cuts, and power and rigidity. In general, chucking work permits this, although bar work often shows a substantial saving also, through the use of combined cuts, and through the great stock reducing capacity of modern turning tools.

Keeping the Machine Busy

This study also gives a definite answer to another important question of the mechanical execu-

by such a machine is shown in Fig. 1. A study of this illustration gives a definite answer to the question of keeping the machine busy.

Experience also shows that the second machine installed for small-lot work is usually a somewhat smaller machine, of ram type, with a bar capacity of 1 1/2 inches, and a chucking capacity for work up to 8 inches, with 16 inches swing. This machine is, of course, faster on the smaller work and requires a smaller investment.

The flow of work under small-lot conditions is often small, and when a mechanical executive looks around his shop on a given morning to check up on the work that might be put on one machine, he is often disappointed, because he apparently finds few jobs. On the other hand, if he looks around

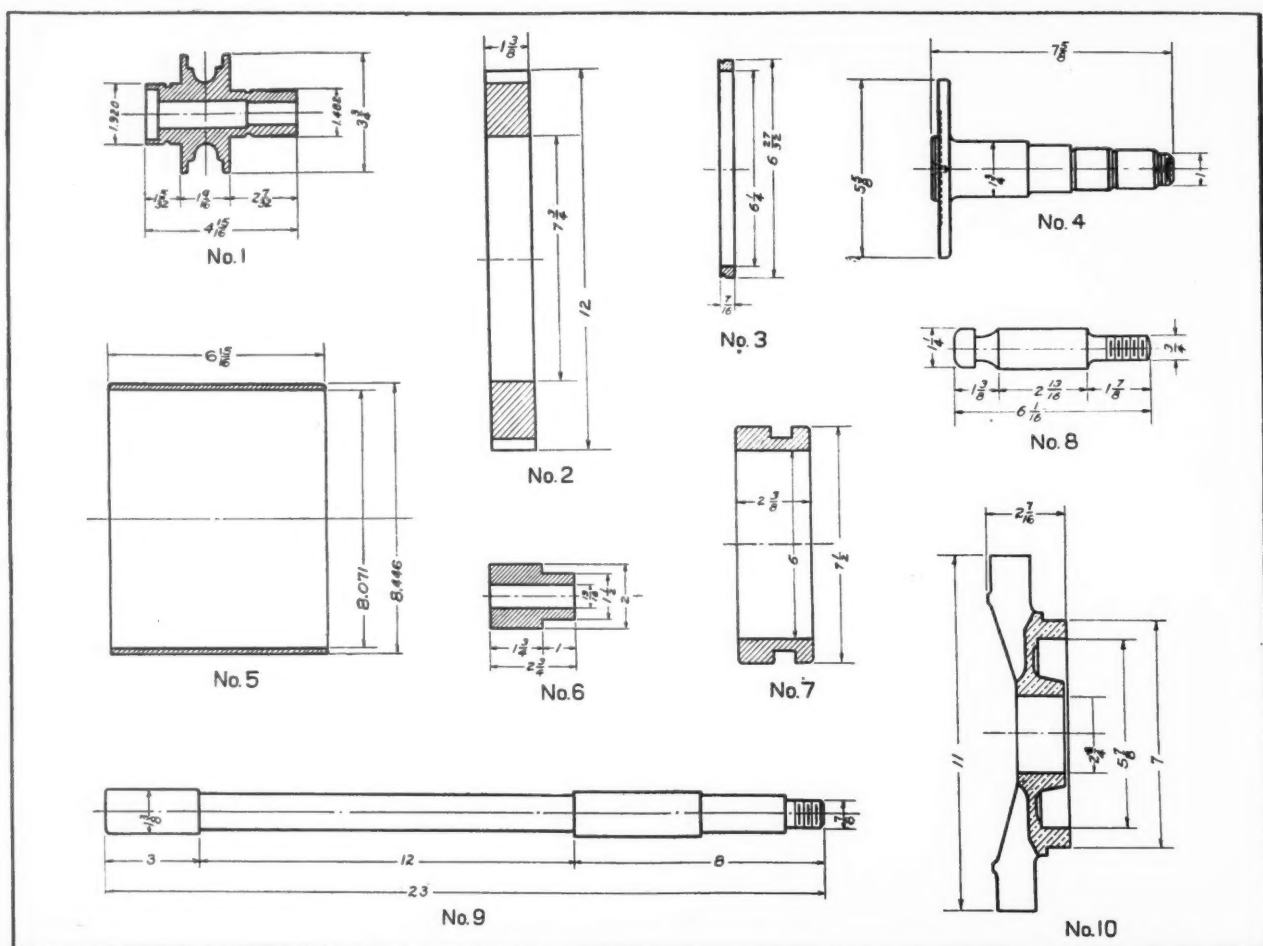


Fig. 2. Examples of Work on which a Time Saving of 58.2 Per Cent was Accomplished by the Use of New Equipment

utive, "Can the machine be kept busy all the time on the work going through a given shop?" A study of this large number of installations shows that under small-lot conditions, when only one machine can be used effectively, it is desirable to buy a large machine. The large machine will handle occasional jobs larger than the average, although it will, of course, be somewhat slower to operate on the smaller work. This loss, however, is not great under small-lot conditions, when a power rapid traverse is provided to move the hexagon turret back and forth. Hence, the first machine installed for small-lot work is usually an all-g geared head machine of hollow hexagon type, with a bar capacity of 2 1/2 inches and a chucking capacity for work up to 12 inches in diameter, with 16 1/2 inches swing. The range of work that may be handled

the next morning he is likely to find more jobs to put on the machine. Frequently small-lot work is stored in the stock-room pending assembly, and a study of the stock-room bins will show a good many pieces that can be handled on a given machine. Often one machine can handle all the work previously done on several machines.

After All, Does It Pay In Net Profits?

The problem of investment, brought up by the purchase of modern machine tool equipment, is one that must be met squarely. Under practical conditions, a shop often has one of the old type machines. It may have little or no book value, and perhaps only a scrap value on the open market; still it is available, and the purchase of new equipment involves an expenditure of a substantial sum of

money. For example, the average purchaser of the machine suggested previously for small-lot production, commonly known as a 2 1/2-inch bar or 16-inch chucking machine, invests about \$3300. The question arises, "Does it really pay to do this?"

The answer lies in figuring the actual net profits from the installation. This must be done conservatively and on a basis that will convince the owners. If it appears, after careful thought, that the machine can be kept busy only 75 per cent of the time, then only 75 per cent of the savings can properly be figured. A depreciation on the investment should be deducted at 20 per cent, which is considerably higher than the usual practice. Provision for unforeseen delays in production should be made by using what is commonly known as a "48-minute hour"; that is, the output of the machine should be figured for only 48 minutes of the hour. On this basis let us consider the actual net profits possible from the installation.

For example, let us take the last ten small-lot jobs reported in the investigation mentioned. These

Time Required to Finish Parts Shown in Fig. 2

No.	Part	Number in Lot	Former Time, Minutes per Piece	Time with New Equip-ment, Minutes per Piece	Percent-age of Saving
1	Chain wheel (steel casting)	9	35	15	57.1
2	Gear blank (forging)	6	120	54	55.5
3	Collar (forging)....	11	65	38	41.5
4	Drive shaft (forging)	35	67	23	65.6
5	Shell (cast iron)....	18	240	90	62.5
6	Camshaft bushing (bronze)	15	40	10	75.0
7	Sleeve (steel casting)	8	90	42 3/4	52.2
8	Plunger-rod (steel)	6	70	45	35.7
9	Valve rod (steel)...	10	75	17	77.3
10	Pump wearing ring (bronze)	20	34 1/2	15	56.5
	Total	138	836 1/2	349 3/4	58.2 aver. Machinery

jobs, as shown in the accompanying table, showed an average saving of 58.2 per cent. To get average results, therefore, for the size of machine under consideration, let us figure the net profits on job No. 2, the gear blank (see Fig. 2) which showed a time saving of 55.5 per cent. The former time was 120 minutes per piece, and the new time 54 minutes, including set-up time. Let us see what this means in dollars and cents.

Savings per Piece

Former cost, 120 min. \times 2 1/2 cents	\$3.00
(With direct labor at 60 cents and overhead at 90 cents, a total of \$1.50 per hour, or 2 1/2 cents per minute)	
Cost with new turret lathe, 54 min. \times 2 1/2 cents	1.35
Saving per piece	1.65

Savings per Year

Production per day, using a "48-minute hour" to allow for usual delays (48 minutes \times 9 hours) \div 54 minutes per piece, 8 pieces	
Total saving per day, 8 \times 1.65 (saving per piece)	\$13.20

To make the example conservative, let us assume that the machine is used only about 80 per cent of the time, that is, instead of 280 full working days per year, let us assume that it is used only 220 days per year.

The total saving per year, before depreciation, is 220 \times \$13.20, or..... \$2904

Investment

Cost of turret lathe with overhead piloted chucking equipment	\$3305.50
Second-hand value in the market of the old machine replaced	150.00

Cash outlay, or added investment required for machine and equipment.....\$3155.50

Net Profit

To determine the net profit, depreciation must be taken from the savings per year; depreciation equals 20 per cent of the added investment in machine and tools, or 20 per cent of \$3155.50	\$ 631.10
Net profits for year	\$2272.90
Per cent of net profit each year on the investment, \$2272.90 (net profit) \div \$3155.50 (investment)	72

Thus the machine shows a net profit of 72 per cent per year when used only part time, in addition to paying 20 per cent toward depreciation. If the machine had been used on a full-time basis of 280 working days per year, the total saving would have been \$3696, the net profit \$3064.90, and the per cent of net profit 97.1 per cent. As a matter of fact, the average percentage of net profit earned on small-lot installations, as shown in a large number of cases, is 114.2 per cent.

What Returns are Reasonable on the Investment

In considering such earning power, financial and general executives, of course, have various ideas of the percentage of net profit required to justify an installation. First they must be assured by the mechanical executive that the possibilities for savings are real; then some executives will purchase equipment with the net profit per year as low as 20 per cent, while others feel that as much as 80 per cent is necessary. In other cases, the executives feel that the net profits the first year, plus the depreciation charge taken in figuring net profits, should equal the price of the machine. This attitude is hardly reasonable under ordinary small-lot conditions, since the total capital invested in the business seldom yields anywhere nearly so high a percentage return, and probably averages 10 to 25 per cent. Of course, where conditions change quite rapidly, as in the automobile industry where new models are constantly coming out, a higher earning figure is justified, especially on machines made for specific jobs and equipped for them; but the purchase of small-lot machinery involves the selection of one machine and standard tooling equipment suitable for a great variety of work over a long period of years. Generally speaking, therefore, where executives are certain that the figures presented by the mechanical men are sound, an earning power of 30 to 50 per cent a year is required before actually purchasing the machine and tools for small-lot production.

The design and development of recent machine tool equipment, particularly in the last four years, has now made available standard tooling equipment on a reasonable cost basis. Since the machine and equipment will handle a wide range of sizes and kinds of work, net profit possibilities are available to reduce substantially small-lot production costs, either in manufacturing plants with small quantities in jobbing shops, in maintenance and repair shops, or in the tool-rooms of the quantity producers themselves.

Mechanical executives, whose chief interest is in production savings, often know that modern equipment is well justified and necessary, but do not have at hand the way to prove their case to the general and chief executives. The latter often fail to realize the dollars and cents value of production savings averaging 50 per cent; hence, the use of a "net profits statement," as suggested in the foregoing, becomes a very effective way of convincing the general executive of the earning power of investment in modern equipment.

Perhaps we may summarize the principles of successful small-lot production of turned parts as demonstrated in over one hundred shops, as follows: (1) The proper machine itself must be provided, a machine that will provide power and rigidity, combined cuts, and multiple cuts. (2) The tooling equipment must be standard, capable of handling a wide range of work, and purchased at a reasonable cost. (3) A reasonably good operator must be provided to set up and handle the machine. The possibilities for net profits under small-lot conditions are substantial and real, as shown by a large number of cases, and cannot be ignored by the progressive manufacturer in his search for profits.

* * *

CHAMFER SPECIFICATIONS ON DRAWINGS

By J. K. OLSEN, Chief Draftsman, Stewart-Warner Speedometer Corporation, Chicago, Ill.

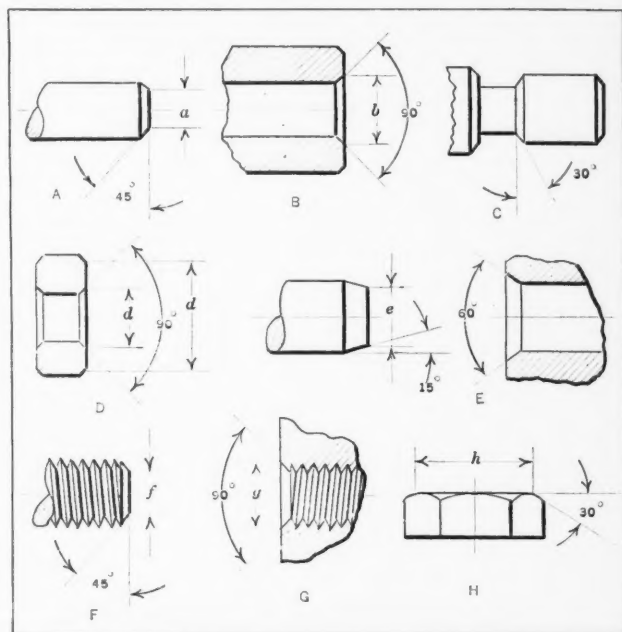
It is important to include on production or working drawings information about small details that frequently are overlooked, such as chamfers on rod ends or at the edges of holes. In designing screw machine parts or the tools for producing them, it is well to remember that troublesome burrs will be formed on the work unless some provision for their removal is specified. Burrs will interfere with the assembling of parts and may appreciably increase the amount of time required.

This matter of burr formation should be considered at the outset, because if expensive forming tools are made without provision for burr removal where necessary, new tools may be required later to avoid the difficulties caused by the burrs. The rough edges and burrs on die-made parts are removed ordinarily in tumbling machines, but parts that are produced in screw machines or other high-production machines should have the burrs removed by cutting edge on some tool, the preferable arrangement being, of course, to remove the burr in conjunction with some other operation.

The accompanying illustration shows several typical examples of work requiring some specification covering chamfer. The plain screw machine rod end illustrated at A should have a 45-degree

chamfer with diameter a sufficient to remove the burr. This chamfer is enlarged somewhat to show it more clearly, which applies also to some of the other views in the illustration. Diagram B shows the chamfer at the end of a plain hole. Diameter b should be sufficient to remove the burr. The chamfered shoulders at C are merely to provide relief at the end of either a thread or a ground surface. Diagram D shows the chamfering of a plain collar, diameter d being sufficient to remove the burr.

Chamfered edges on some parts are not intended for burr removal, but to facilitate assembly or possibly the machining of a part. For example, external and internal parts to be assembled by a press fit should be chamfered as indicated at E, diameter e being small enough to permit entering the hole without forming a burr. This chamfer



Examples of Work Requiring Chamfer Specifications on Drawings

will also assist in locating the shaft relative to the hole in starting the press.

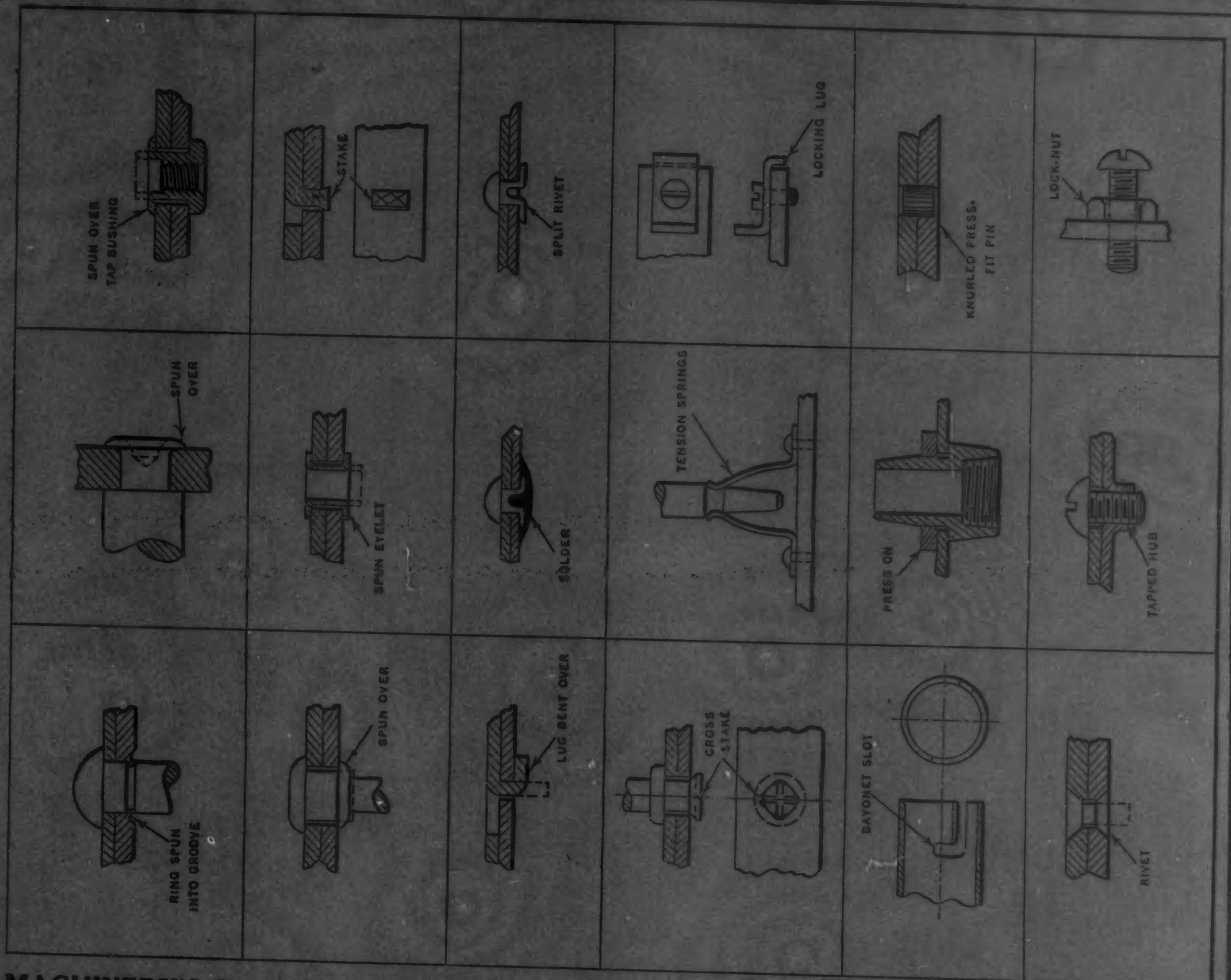
A chamfer at the end of a threaded part, as at F, will facilitate starting a screw into a tapped hole. The diameter f is slightly less than the minor or root diameter. A tapped hole should also be chamfered, as at G, to assist in starting the tap and in assembling. The diameter g should be slightly larger than the outside diameter of the thread or tap. The chamfering of a nut is shown at H, diameter h of the chamfer being the same as the width across the flats.

* * *

Ask the average American what country leads the world in the domestic use of electricity and he will probably reply "the United States." But, according to a recently issued Department of Commerce report, we stand sixth. Switzerland, Japan, Denmark, Canada and New Zealand, in the order named, surpass us in the proportion of homes equipped for electric service. In Switzerland 96.5 per cent of the homes are electrified, but in the United States, where electricity was first commercially applied, the percentage is only 56.—*Commerce and Finance*.

MACHINERY'S DATA SHEETS 111 and 112

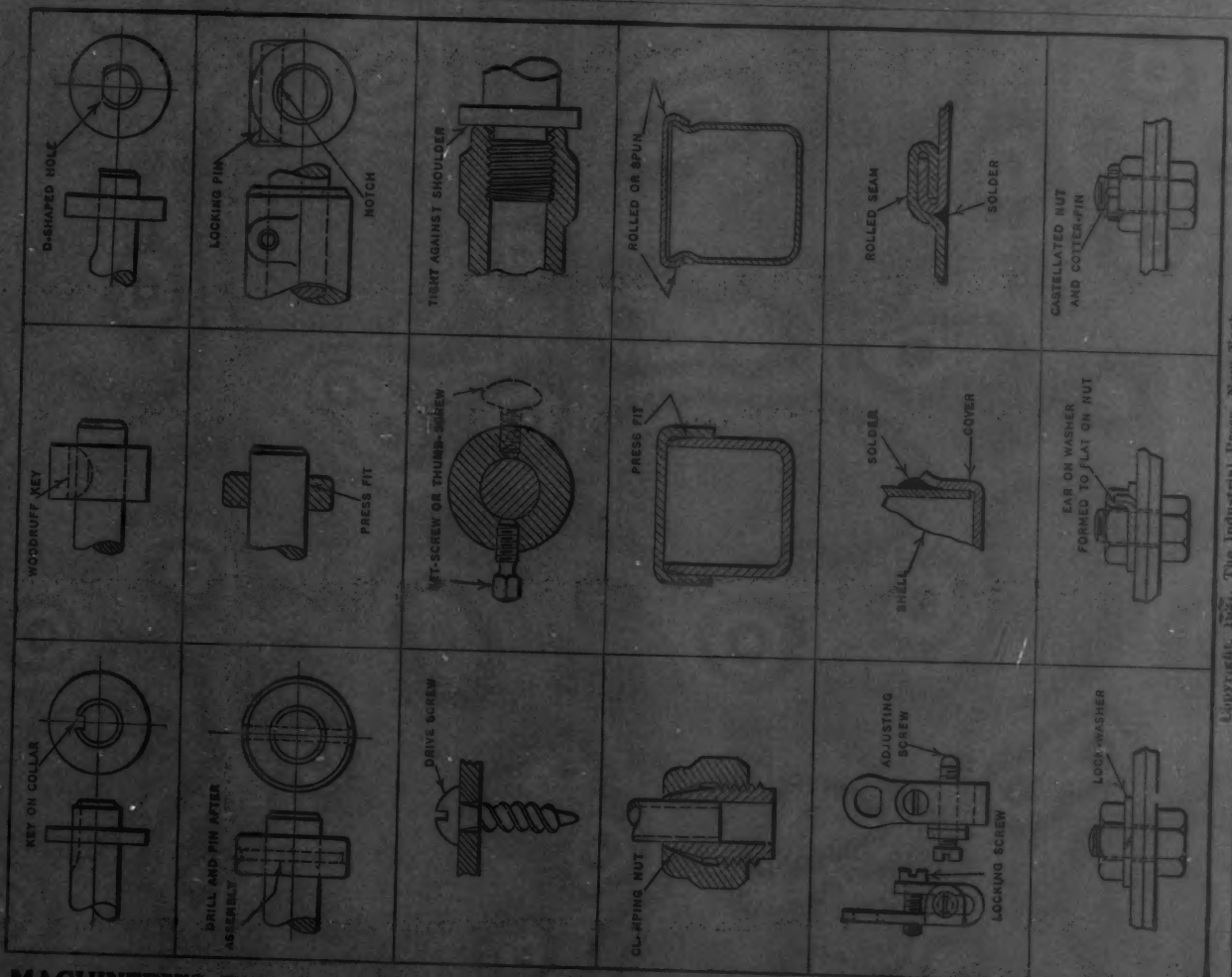
FASTENING MEANS



MACHINERY'S Data Sheet No. 111, New Series, August, 1927

Contributed by J. K. Olsen

FASTENING MEANS



MACHINERY'S Data Sheet No. 112, New Series, August, 1927

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MACHINERY, August, 1927—900-A

The British Metal-working Industries

From MACHINERY's Special Correspondent

London, July 16

IN the metal-working industries conditions, on the whole, are dull, and evidence is not wanting that the seasonal period of "marking time" has set in. At the same time there are no definite signs of retrogression, and this may be regarded as encouraging. The unemployment figures, which provide the best indication of the general state of industry, after rising sharply at the time of the Whitsun holidays, have since made a steady recovery, the latest figures given being 987,300. Large as these figures may appear it must be realized that about 30 per cent represents temporary unemployment only.

Little Change in the Machine Tool Industry

Conditions in the machine tool industry are still rather uneven, the heavy tool sections being the least prosperous. Government departments and home and overseas railways have been the principal customers for heavy machine tools in recent months. Better conditions prevailing in the shipbuilding industry should, in due course, react on the heavy machine tool trade.

In the Manchester district, machine tool makers note a falling off in the number of orders booked, but the prevalence of inquiries augurs well for the future. In the Midlands, business is fairly well maintained, the automobile and allied industries proving the most important customers.

Overseas Trade in Machine Tools Improves

The exports of machine tools in May were much more satisfactory than in April, and had the effect of improving the monthly average for the current year, over the previous four months, to the extent of 1 per cent in machines and 3 per cent in tools and cutters.

The exported tonnage of machine tools rose from 791 in April to 1111 in March, with a corresponding increase in value from £99,660 to £127,746. The ton value, however, fell slightly from £126 to £115. The import figures for May are substantially the same as those for April, having increased from 804 tons to 824 tons. In spite of this slight increase, the total value fell from £113,123 to £97,218. As is evident from these figures, the ton value again fell from £141 in April, as against £182 in March and £200 in January, to £118.

The exports of small tools and cutters increased from £43,097 in April to £56,803 in May. The ton value of exports is rising from the severe fall in 1925, but is still 7 per cent below standard. Although imports are very unsteady, they fluctuate at a high level over double the tonnage and value of the 1921-1924 period.

If a comparison is drawn between the exports of British machine tools only (not tools and cutters) in 1925 and 1927 on the basis of total value, considering the first five months of each year, it

will be found that total exports have fallen about 15 1/2 per cent. Practically all the loss is in the European markets with some loss in South Africa and Australia.

The relative importance of the various overseas markets is indicated by stating that 5 per cent of the total value of machine tools exported during the first five months of this year went to South Africa, 13 per cent to Australia, 17 per cent to Europe, 28 per cent to India, and 37 per cent to other places. Two years ago Europe took 23 per cent of a larger total.

Activity Reported in Shipbuilding Industry

The conditions prevailing in shipyards generally continue to form a welcome exception to a rather dull outlook, and provided activity is maintained in this quarter, as seems probable, other industries are certain to benefit. Ship repairing yards, on the other hand, are only moderately employed, and in some cases are badly in need of new contracts.

Electrical and Railway Engineering Fields are Busy

Heavy electrical firms continue to be well employed, and some large new orders have recently been placed, chiefly by municipalities and other public bodies. Good conditions in this industry are assured for some time to come.

In the railway engineering industry, an improvement is noticeable, and a number of substantial orders have recently been booked. Several machine tool makers in the north of England have received orders for railway shop equipment, and this may be taken to indicate that the industry is on the up grade.

Some Improvement in the Iron and Steel Fields

In the iron and steel industries, Continental competition is still keenly felt, but the continued fall in the price of blast furnace coke should do much to remove the discrepancies which exist between British and Continental pig iron prices. In the Sheffield district, an improved demand for heavy castings and forgings has been experienced, but rolling mills are still working at little more than 50 per cent of their capacity.

The Automobile Industry is Quiet

The automobile industry cannot be said to maintain the high state of activity exhibited earlier in the year, and there can be little doubt that the inclement weather experienced so far this summer has had its effect on the home sales. One or two firms producing light and popular-priced cars are finding the pressure of work sufficient to necessitate employing over-time and night shifts, although such conditions are by no means general. Large orders have recently been booked by gear-cutting firms for automobile gears. Commercial vehicle manufacturers are generally well employed.

Current Editorial Comment

in the Machine-building and Kindred Industries

DUBIOUS CORRESPONDENCE SCHOOLS

Thousands of successful men in the mechanical industries have obtained their specialized education at home with the help of reputable correspondence schools. But the success of the pioneer institutions has encouraged others, less scrupulous, to enter the field. At the annual convention of the American Association of Engineers, H. A. Wagner, chairman of the association's national correspondence school committee, presented a report in which the methods of some of these schools were thus described:

"Prospective students are promised everything," says the report, "from positions paying \$10,000 a year to job guarantees. A very alluring picture is painted of what you get for \$100 or more, payable at the rate of \$5 a week or month. The educational standards of some of these schools are such that they are offering courses written fifteen years ago and never revised. . . . They undertake to make an engineer of anyone who has the price, within the short space of from three to six months."

Men ambitious to obtain a technical or engineering education are warned to investigate thoroughly the reputation and standing of any correspondence school they contemplate taking a course with before signing a contract. While some of them have excellent courses and are directed by men of unquestioned ability and integrity, others make promises that cannot be kept, and offer incomplete and out-of-date courses.

CREDIT FOR INVENTIONS

It is a significant fact that practically all epoch-making inventions have been due to the work of more than one man, the cotton-gin of Eli Whitney being one of the few notable exceptions. There have been two stages in the development of most great inventions. The first is related to the purely theoretical or scientific part of the work, and the second, to practical and commercial development.

Frequently men whose chief interests are centered upon scientific research make certain fundamental discoveries; then along comes the man

whose natural bent lies in applying principles and elements in a practical way. The one who finally receives credit for the invention may have done little more than use what had been handed down to him by earlier scientists or inventors. While the general public recognizes the importance of the pioneer or purely scientific work, it is inclined to give the lion's share of credit to the man who achieves practical results. In some instances, such an achievement is not due so much to scientific knowledge and inventive ability as to enthusiasm

and perseverance in perfecting crude laboratory devices and in securing the capital required in making them a commercial success.

Many scientists and originators of basic ideas have not been awarded the credit due them, because the most important part of the work is to develop a practical invention that is obtainable for general use. Popular recognition is received by the inventor who makes a usable telegraph, telephone, electric light, or sewing machine, because he deals directly with the needs of the public.

ADVICE TO WRITERS

There is a simple rule which would greatly aid the writer on technical subjects, whether in preparing a report, describing a machine or method of manufacture, or explaining mechanical principles. That is to use sub-headings throughout the article and to deal under each sub-

heading only with that part of the subject into which the treatise has been subdivided.

When writers do not subdivide their articles in this way, it is difficult for them to maintain a logical sequence in their treatment of the subject. They are likely to wander from one subject to another, returning to explain some point that previously was omitted. When sub-headings are used throughout the article, it becomes at once evident that everything relating to one subdivision of the subject should be dealt with in one place; the whole arrangement becomes more logical, the reader gets a better grasp of the subject with less effort and can more readily understand the mechanism or process described.

'WRITE-UPS'

Editorial Republished from MACHINERY,
November, 1894

Some intending advertisers have asked us how many 'write-ups' we could give them during the year, and our answer was that—as the term is understood—we could give them none. The policy of MACHINERY is not to insert any reading matter that has ever been published in this country, with the single exception of 'Manufacturing Notes,' under which head we propose to concisely describe new catalogues and matters of interest to our advertisers and the trade generally.

Any advertiser who stops to consider the question will at once see that this rule is for his direct benefit as well as for the good of the paper, because the very first requisite of an advertising medium is that it shall be read; and who reads 'write-up' papers? Nobody. 'Write-ups' are the curse of trade journalism, for they never contain any news and seldom any information. They are impositions on the good faith and good nature of the men who buy the paper for news, and they are tokens of dry rot wherever they appear. Beware of papers liberal with 'write-ups.' Space in them is of little value or it wouldn't be given away.

A Policy Adhered to for Thirty-three Years

Judging the Performance of Tools and Grinding Wheels

MANUFACTURERS of small tools and makers of grinding wheels frequently find that equipment supplied by them is complained of, when, as a matter of fact, it is the machines in which they are used and not the tools or wheels themselves that are responsible for the unsatisfactory performance. An opinion cannot be formed about the performance of cutting tools and grinding wheels apart from the machine in which they are used. Many complaints are made without thorough investigation, and without any data that would give the maker of the auxiliary equipment a clue to the real trouble. So often the machine is at fault when auxiliary equipment does not give satisfactory performance that in every case when difficulties are met with, a thorough examination should be made of everything connected with the work, including bearings, spindles, slides, lead-screws, etc., on the machine being used, as well as the clamping means, the methods of holding the work, and the tools themselves.

There are instances on record where users of auxiliary equipment have actually ordered and used an inferior product, because only by so doing were they able to overcome the defects that were due in the first instance to a loose bearing or a spindle that was running out of true. There are too many defective machines in use throughout the country, and much better results would be obtained from the auxiliary equipment if the machines themselves were in first class condition. Because of this, the user of the tools loses production, and the maker of the tools loses business and reputation. The shop men also frequently are losers, because they are unable to make time and earn piece rates or bonuses with defective machinery.

Two cases have recently come to our attention that illustrate the points made. In one instance, a buyer of grinding wheels ordered a certain kind of wheel for grinding small shafts. The wheel manufacturer believed that a different wheel would give better production, and in filling the order recommended another wheel. The customer ordered both wheels and placed them on trial, but reported that the wheel that had been recommended by the wheel maker produced only 4000 pieces in a given time, as compared with 7000 pieces from the wheel selected by the user himself. The wheel manufacturer could not understand this discrepancy, as there was no possible reason why the wheel recommended should not have produced at least as much as the wheel selected by the customer himself. A service man was therefore sent to make a thorough investigation of the work with the following result.

It was found that the customer had two machines in operation on exactly the same work with speeds and feeds set in an identical manner. The wheel recommended by the wheel manufacturer

was employed on machine No. 1 and the wheel supplied to the customer's own specifications on machine No. 2. The service man exchanged the wheels between the machines, and when the tests were repeated, the wheel recommended by the wheel manufacturer, now employed on the No. 2 machine, produced 8000 pieces, while the customer's wheel that had formerly given such good results, produced only 3500 pieces in the same time.

Following up the investigation, it was found that the spindle bearings on the No. 1 machine were in need of adjustment and that the only reason for the unsatisfactory results was this defect in the machine. It was further ascertained that the wheel recommended by the wheel manufacturer was approximately 15 per cent more efficient than the customer's own selection. This indicates the great importance of thoroughly investigating all the factors involved when a test run is made.

In the second instance, the investigation related to crankshaft wheels for the grinding of crankpin bearings. The crank for a six-cylinder engine has six pin bearings, which, for convenience, we will number 1 to 6, consecutively. Nos. 1 and 6 are then the two outside pins which will be on the same centers and are ground at the same set-up. Pins Nos. 2 and 5 will also have a common center, and pins Nos. 3 and 4, which are the two inside pin bearings, will have a common center.

In one instance, an automobile manufacturer was able to obtain an average production of 500 cranks, two pins to each crank, during the life of the wheel. The wheel manufacturer recommended another wheel, and it was found that the wheel recommended averaged 537 crankshafts, or an improvement of 7 per cent. This was not considered sufficient to call for a change in wheels. It developed later, however, that the test runs had been made on Nos. 3 and 4 pins. Tests were, therefore, later made on pins 1 and 6, 2 and 5, and 3 and 4, separate reports being made for each grinding. The result was that on pins Nos. 2 and 5, the production per wheel was 819 crankshafts, and on Nos. 1 and 6, the production was 866 crankshafts, an improvement for the two latter cases of over 60 and 70 per cent, and an increase in the average production, for the three sets of pins, of 44 per cent.

The reason for the difference in production of wheels of the same grit and grade on the various pins is due to the fact that the wheel life is decreased as the pins to be ground approach the center of the crank. Pins Nos. 1 and 6, which are the outside pins and are closer to the heads, are more rigidly supported than the other pins, and pins Nos. 2 and 5 are more rigidly supported than the inside pins Nos. 3 and 4. The vibration set up when grinding the inside pins has a marked effect on the performance, life, and productivity of the wheel. If the test had been ended after grinding

pins 3 and 4, the wheel user might never have realized the advantages to be gained by the type of wheel recommended by the manufacturer, but the complete and thorough test covering all the conditions now saves about 45 per cent of his wheel costs for this particular operation.

In cutting tools, much the same conditions are encountered. Drills, reamers, and milling cutters are pronounced good, bad, or indifferent on no other investigation than mere snap judgment, and when tests are made, they are frequently too incomplete to permit of definite conclusions. Also, it is frequently forgotten that the machine in which the tools are used often has more to do with the performance of the tool than the quality of the tool itself, and many a high-grade tool is condemned because it is used in an old worn-out machine or a machine that is not properly adjusted for the work it is intended to perform.

* * *

GRINDING NOTCHED-TOOTH INDEX-PLATES

Notched-tooth index-plates of the design shown at A, Fig. 2, are used on several sizes of bevel and spiral-bevel gear generators built by the Gleason Works, Rochester, N. Y. The limits specified for the distance from tooth to tooth on these plates are plus and minus 0.0002 inch. To obtain this degree of accuracy, both sides of the teeth are ground on the machine illustrated in Fig. 1, which comprises a standard gear-cutting machine on which the regular table has been replaced by a grinding wheel carriage. A large dividing wheel contained within housing D has been provided for indexing the work-holding spindle. This wheel has 240 teeth, and reduces to a minimum any error on the work that might be due to the indexing mechanism. The regular indexing mechanism of the machine drives this large wheel.

The drive to the grinding wheel carriage gives forward and return movements at the same rate

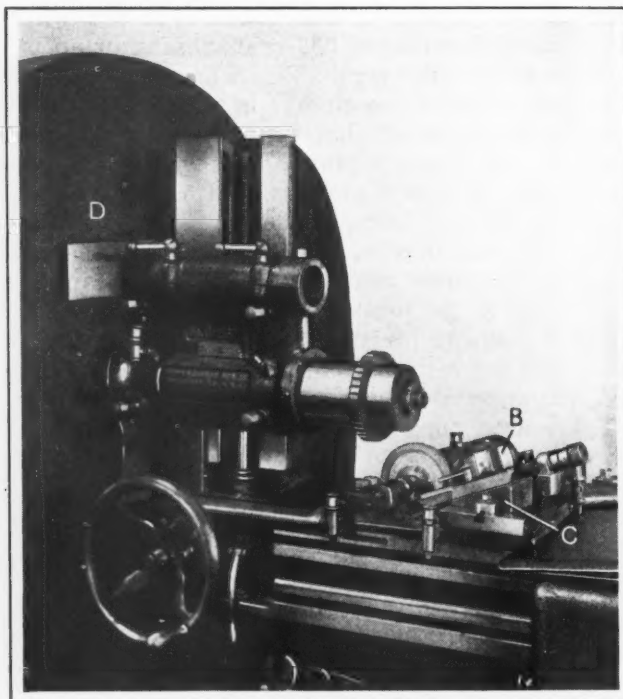


Fig. 1. Special Equipment Employed in Grinding Notched-tooth Index-plates

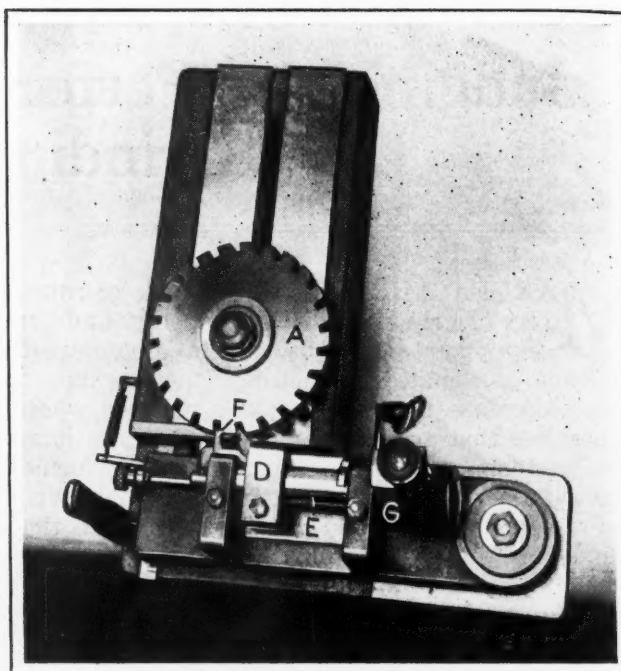


Fig. 2. Inspection Fixture Used for Checking the Tooth Spacing of the Index-plates Ground on the Machine Shown in Fig. 1

of speed. The travel of the carriage is sufficient to allow automatic indexing of the work at the end of the return stroke. There is no movement of the work except the rotation for indexing. Only one side of each tooth is ground at a time. Often the teeth have a slight rake, instead of being radial, and then the grinding wheel must be set off center in relation to the work, to correspond. A micrometer adjustment that is central with the wheel-spindle facilitates making this setting.

For most of these index-plates, one side of the wheel is dressed to an angle of 3 degrees for grinding the front face of the teeth, and the other side is dressed to an angle of 7 degrees for grinding the back of the teeth. Dressing of the wheel is accomplished by means of a diamond contained in holder B. This holder has a tongue which can easily be slipped into three dovetailed grooves machined in casting C, for guiding the diamond accurately in truing the two sides and the periphery of the wheel. The grooves used in dressing the sides are, of course, inclined at the necessary angles.

Checking of the teeth for accuracy of spacing is accomplished by means of the device shown in Fig. 2. This device has two fingers, one of which is held in block D. This block may be clamped in various positions along tube E on which it is mounted, for holding the finger stationary for an inspection. The second finger F is movable relative to the first to permit variations in the distance between any two teeth of an index-plate. Movements of this finger actuate a rod in the center of tube E which, in turn, imparts a similar movement to a graduated scale within the "Optimeter" G. Thus, in checking the teeth of an index-plate, the amount of variation from the normal dimension can readily be observed through the eye-piece of the "Optimeter." This instrument gives readings direct to 0.00005 inch, but as the graduations of the scale within the instrument appear to be about 1/16 inch apart, it is possible to estimate errors still more closely.

Why Machined Castings Change Shape

By FORREST E. CARDULLO, Chief Engineer, G. A. Gray Co., Cincinnati, Ohio

A SHOP problem about which there has been a great deal of discussion is the seasoning of gray iron castings. Of course, the object in seasoning a casting is to prevent it from changing form after it has been machined ready for use. A casting that has been machined to a given form and dimensions frequently becomes slightly warped or changed in shape after a short time. It is then necessary to file or scrape the casting in order to bring it to the required form. Holes will often be found to be too large or too small, and other faults may develop.

Although a change in the form of a casting may result from various causes, there seems to be a general impression that a casting which has been subjected to strains or which has had its stresses relieved in some manner, will change slightly in shape, either after pouring or after machining, and that a period of standing or seasoning ranging from two or three weeks to about a year or more, depending upon the individual practice, is necessary in order that the casting may assume a stable form before being used. A great many factors, the effects of which have been observed in different jobs, may be involved in the change which the casting undergoes, and before discussing the seasoning of castings, it may be well to consider some of these factors.

Causes of Change in Castings

There are three general causes for a change in the shape of castings after they have been poured and cooled: (1) Relief of internal strains by the removal of stressed metal; (2) variation in temperature of the different parts of the casting; and (3) spontaneous change in the atomic arrangement of the crystals of the casting. In addition to these causes, the application of forces sufficient to distort the casting while it is being machined results in inaccurate work.

Effect of Removing Stressed Metal

Let us consider the first factor and see how it works out. In this case, assume that a ring is being bored out. In order to hold the ring in the lathe, force is applied by means of chuck jaws or set-screws at two, three, or more points on the casting. This results in distorting the casting while the process of machining is going on. If a sharp tool is used for boring and a true cylindrical hole is produced, the hole in the distorted casting will be lobe-shaped when the casting is removed from the chuck. The points on the inner surface that were formerly free will be closest to the axis of the hole, while the points where the clamps were applied will be furthest from the axis.

Obviously, this is not a case where the trouble will be remedied by seasoning. Nevertheless, this may be cited as a typical case in which seasoning may be given undue credit for remedying the

trouble. The usual procedure would be to rough-machine the ring, which would require heavy machining, and then allow it to stand for a period of several weeks or months to season before it is finished. As the finish cuts would be light in this case, only light clamping of the work would be necessary and consequently, the ring would not be distorted or changed in shape after the light cuts were taken.

Of course, under these conditions, seasoning has very little to do with the result, and the work might just as well have been finish-machined without seasoning, provided the clamps were released after taking the heavy roughing cuts, and retightened lightly on the work for the finishing cuts. In some cases, the pressure of the tool itself, instead of the pressure of the clamps, serves to distort the work. This frequently happens in milling machine operations.

Seasoning and refinishing is of benefit in most cases, not because the piece changes shape slowly during the process of seasoning, but rather because the light cuts of the finishing operation do not distort the work so much as the heavy cuts of the roughing operations. A good example is that of a flat piece which was slightly warped and was clamped to the table of a planer for the machining operations.

As soon as the clamps were released, the work resumed its natural form, and the planed surface, which was flat while held in place by the clamps, became warped as soon as the piece was released. The amount of warpage, however, is usually very much less than the original amount. This warpage may be eliminated in some cases by setting the pieces aside after the first rough-machining operations, then repeating the machining operations, and taking the finishing cuts later.

Here, again, we have a case in which seasoning plays no real part. The mistake was made by the machinist who performed the operation and who, not understanding one of the fundamental principles involved, neglected to take precautions that would have insured good work in the first place. Following the proper procedure after letting the work stand, however, he succeeded in producing a good job, but the time interval had nothing to do with the elimination of warpage.

Cause of Distortion Often Misunderstood

Every machinist who has studied the properties of materials will avoid the first source of errors in most cases. Sometimes he may forget, and sometimes convenience dictates such methods of clamping as will distort the piece beyond the permissible point. When the cause of the error is understood, however, it can be corrected without resorting to the process of seasoning, which has nothing whatever to do with the distortion of the casting in this particular case.

A second cause of trouble in machining castings is the relieving of internal strains which have been set up by unequal cooling or by some heat-treatment of the casting. Let us consider two cases, which will illustrate our problem very clearly but have nothing whatever to do with castings. Suppose that a shaft is crooked and that it is necessary to straighten it by means of a straightening press. In straightening the shaft, the material on the concave side is stretched beyond its elastic limit and that on the convex side is compressed beyond its elastic limit.

Let us assume that the stresses set up in straightening hold the shaft straight against the action of the opposing stresses within the interior of the shaft. If, after straightening, the outside of the shaft is turned, it will again become crooked, because the turning operation removes the exterior fibers which resist the action of the interior fibers, and the latter, being free to act again, will cause the shaft to bend. Repeated turning is therefore necessary to produce a straight shaft, and in the final finishing operations, a number of relatively light cuts must be taken. This is well known by those who have had experience in this kind of work, and is therefore not considered to be a case that requires seasoning but one to be handled as outlined above.

Effect of Stresses from Peening Flat Surfaces

If a piece is peened on the concave side, it will straighten out, because the action of the peening tool causes the material to spread and lengthen the concave side, thus straightening the piece. The peened material, for a slight depth, is in a state of compression, and its compressive stresses oppose the tensile stresses of the material underneath. As soon as the stressed material is removed by planing, the piece springs back to its original shape. In such cases, the material was purposely subjected to stresses in order to change its form. In a succeeding article, to appear in September MACHINERY, the cause and effect of stresses will be given further consideration.

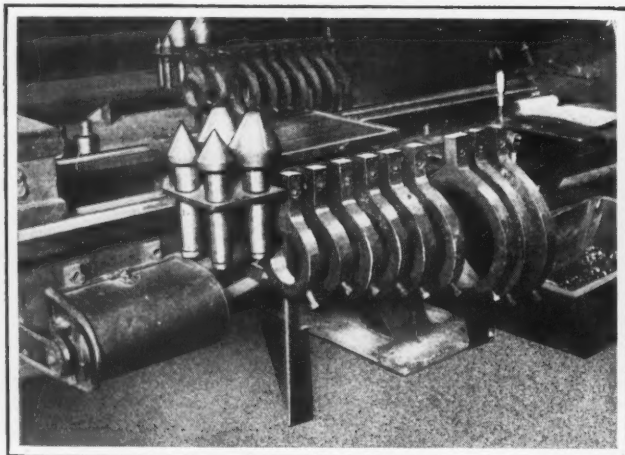


Fig. 2. Racks for Lathe Centers and Dogs

RACKS FOR HOLDING TOOLS AND BOLTS

By J. R. PHELPS, San Bernardino Shops, Atchison, Topeka & Santa Fe Railway Co., San Bernardino, Cal.

Sometimes it is considered advisable to keep certain tools at a machine, and when this is so, a conveniently located tool rack is desirable. Fig. 1 shows a simple form attached to the housing of a boring mill for holding different boring-bars. This rack is made of a piece of sheet steel, bent to a U or channel shape. The tools fit into holes cut in the upper and lower sides, and the tools are prevented from dropping through by a bar or retaining strip on the under side. This method of holding tools is much better than the more common way of using an inconveniently located stand, or possibly putting them on the floor.

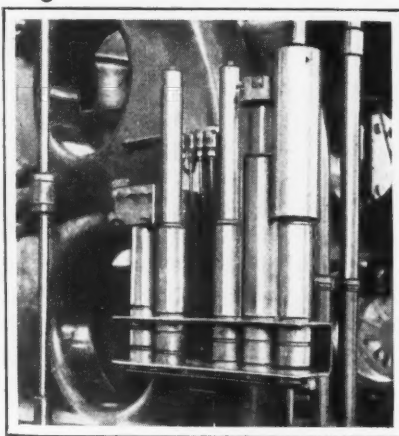


Fig. 1. Simple Form of Tool Rack Attached to Boring Mill Housing

Fig. 2 shows a simple form of rack for holding lathe dogs and lathe centers. This is attached to the rear of the lathe bed. The dog rack is made of a piece of 3- by 3-inch angle-iron, 42 inches long, which has 5/8-inch studs inserted in it. The dogs have holes drilled in them to permit them to be hung on the studs. The rack for holding the centers is merely a drilled plate, as the illustration shows. When centers are kept in this way, they are not likely to be marred, and it is easy for the foreman to inspect them.

A convenient form of bolt rack is shown in Fig. 3. This is made of a strip of 1/8-inch boiler steel, which has notches in it to receive the bolts and is bent like a piece of angle-iron. Anyone who has searched for machine bolts when they are kept in a disorderly way will appreciate this improved bolt rack, which saves considerable time in setting up work on a machine.

* * *

The automotive division of the Department of Commerce states that increased use of American automobile service equipment is bringing about noticeable improvement in the maintenance work of automobiles in Europe. The export trade in automobile service equipment has increased rapidly in recent years, and the convenience of the American devices are generally recognized.

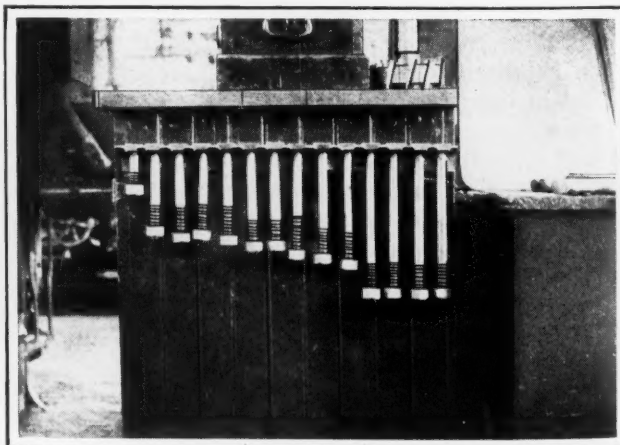


Fig. 3. Rack for Holding Machine Clamping Bolts

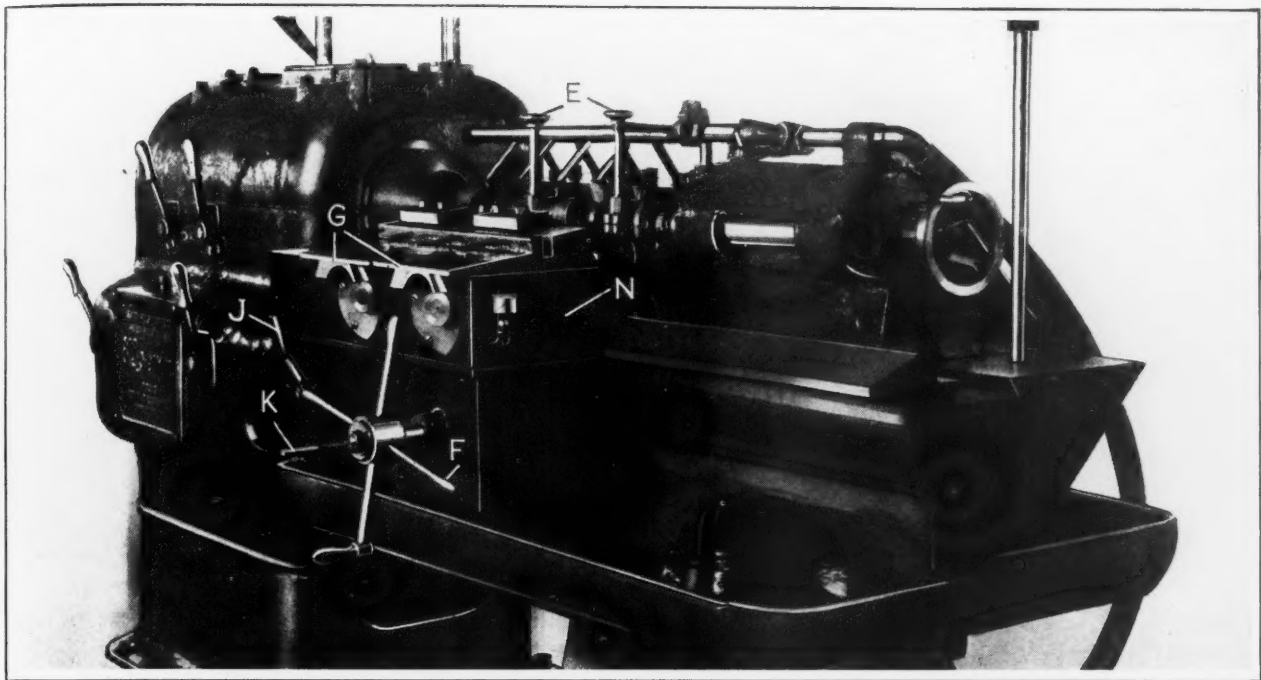


Fig. 1. Equipment Designed for Beveling the Outer Ends of the Cheeks of Automobile Crankshafts

Beveling Crankshaft Cheeks

ALL eight cheeks on Dodge four-cylinder automobile crankshafts are beveled simultaneously at the outer ends in the machine here illustrated. This machine is a standard "Lo-swing" lathe manufactured by the Seneca Falls Machine Co., Seneca Falls, N. Y. It is equipped with an automatic fixture designed for the job mentioned. The actual cutting time per crankshaft for this operation is 1.1 minutes, the floor-to-floor time averaging less than one minute. One man runs two machines. Cuts are taken by four tools mounted on the two front cross-slides and by the same number of tools mounted on the two rear cross-slides. Both the front and rear cross-slides operate in a steel casting that is clamped stationary to the machine bed. The operation is performed after the crankshafts have been rough-turned and rough-faced all over.

From the diagram, Fig. 3, it will be seen that the main bearing on the front end of the crankshaft is seated in a bearing of chuck A. This driver bearing is of split design, one half of which can be quickly swung open with a cap or locked in the closed position. A plate fastened to the front end of the driver rotates the crankshaft by bearing against the first crank-arm.

The main crankshaft bearing adjacent to the flywheel flange is supported in rest B, and the middle main bearing in rest C. Both rests are of split design, and their upper hinged caps are conveniently locked in place by tightening rods

E, Fig. 1, after the caps and rods have been swung into place. Rest C, Fig. 3, is equipped with a hardened steel split bushing D which comes in contact with the rough-faced shoulders of the adjacent crank-arms and thus locates the crankshaft lengthwise in the lathe. In addition to the support offered by driver A and the two rests, the crankshaft is backed up by the tailstock center.

One work speed only is provided, as the machine is of single-purpose design. After the crankshaft has been placed in the machine and the caps of the driver and rests have been locked, the operator revolves capstan wheel F, Fig. 1, to move cross-slides G and cross-slides H, Fig. 2, toward the center of the machine. When the tools mounted on these cross-slides have almost reached the work, the operator moves handle J, Fig. 1, which engages a worm with its worm-wheel and thus starts an automatic slow feed of the cross-slides. As the cuts are completed, a dog on one end of the front cross-slides depresses a plunger which, in turn, releases a latch connected to the box of the feed-worm. This movement causes the worm to drop out of mesh with the worm-wheel and ends the feed.

Simultaneously with the disengagement of the worm, a sawtooth clutch in apron N is engaged, reversing the four cross-slides at a rapid rate until they reach their starting positions. Then a second dog on one of the front cross-slides operates a second plunger, pulling the sawtooth clutch out of engagement and thus stopping the

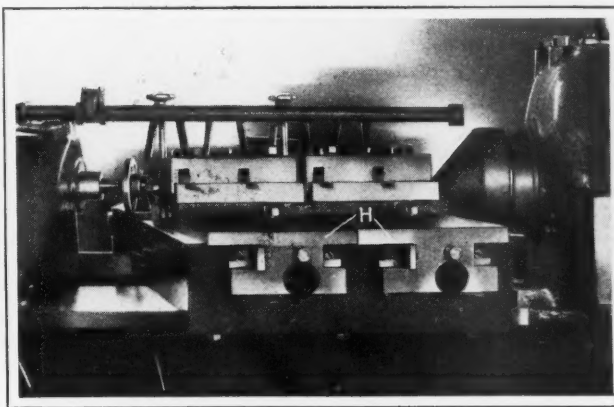


Fig. 2. Construction of the Two Rear Cross-slides

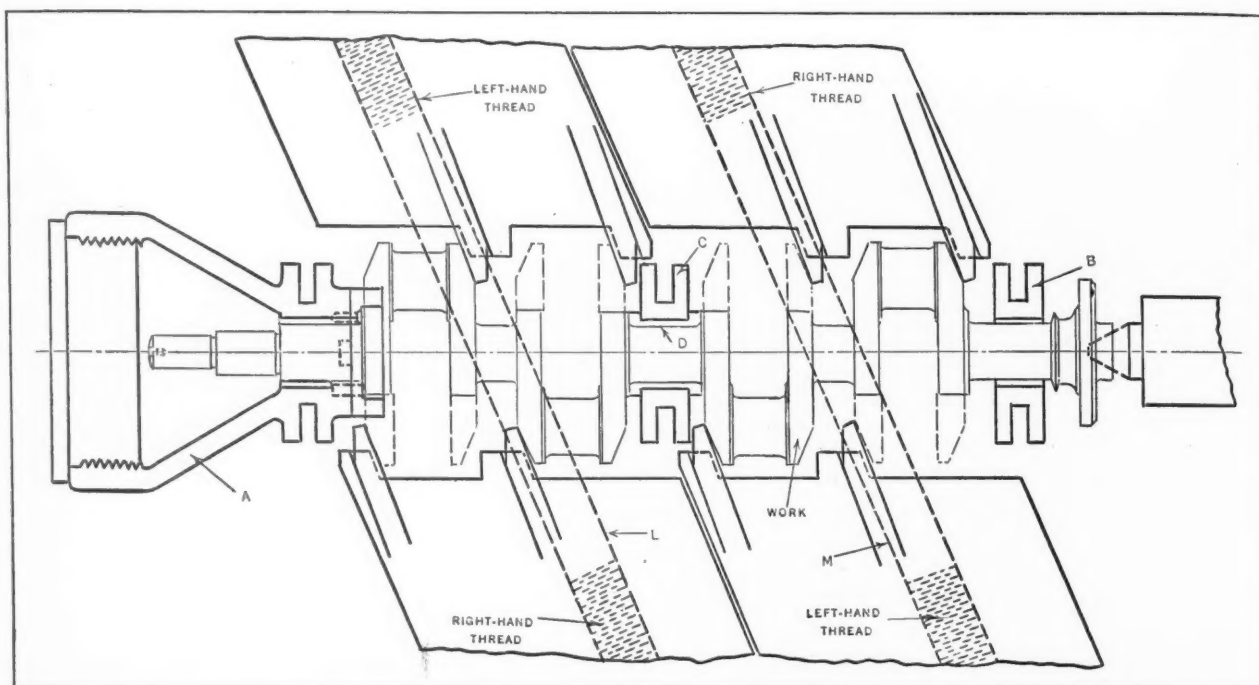


Fig. 3. Diagram Showing How Each Crankshaft is Held, and the Position of the Tools with Respect to the Work

movement of the cross-slides until the operator starts the machine again. Disengagement of the feed-worm can be accomplished at any time during an operation by merely depressing lever *K*, but in that event, the sawtooth clutch is not engaged and the cross-slides do not reverse.

The feeding movement is imparted to the four cross-slides by means of two screws *L* and *M*, Fig. 3, which extend from the front to the rear of the beveling attachment. These screws have right- and left-hand threads at their opposite ends, which pass through nuts fastened to the cross-slides. Obviously, as the screws are revolved, the cross-slides are fed either toward or away from the center of the machine, depending upon the direction in which the screws are rotated. In order to finish the crankshaft cheeks at the desired angle, the feed-screws and cross-slides are positioned at an angle of 19 degrees 50 minutes from a line perpendicular to the center line of the machine.

The front cross-slides operate in dovetail ways fitted with adjustable taper gibs, whereas the rear cross-slides move in square ways that are gibbed on three ways. This construction is employed for the rear cross-slides, because the tools receive the cutting pressure on the bottom as the rear side of the work revolves upward. Adjustable blocks on the rear cross-slides provide for positioning the tools.

Power is delivered from the headstock to the mechanism in apron *N*, Fig. 1, through a combination Oldham coupling and slip clutch. Thus, if undue pressure is placed on the tools or the mechanism during an operation, the clutch slips and prevents damage to any part. The drive shaft of the apron delivers power through bevel gearing to the feed-worm previously mentioned and then through bevel gears to the feed-screws for the slow feed. For effecting the reverse movement of the cross-slides, power is transmitted through spur and bevel gears direct from the drive shaft to the feed-screws.

The main castings are those of the 8-inch "Lo-swing" automatic lathe and are standard, with the exception of the bed, which is provided with an extra wide flat rear way, 12 inches wide, to give a firm support to the slide base. Hardened steel plates are provided on the front bed way. Lubrication is supplied to the mechanism in the apron through the large oil-cup seen on the right-hand end of apron *N*. A centrifugal pump delivers coolant to the cutters.

With slight changes, equipment of this type could be arranged for handling six-throw crankshafts of various styles. Also if it is desired to use the machine in the standard manner for the usual line of work, this can be done by simply removing the special fixture.

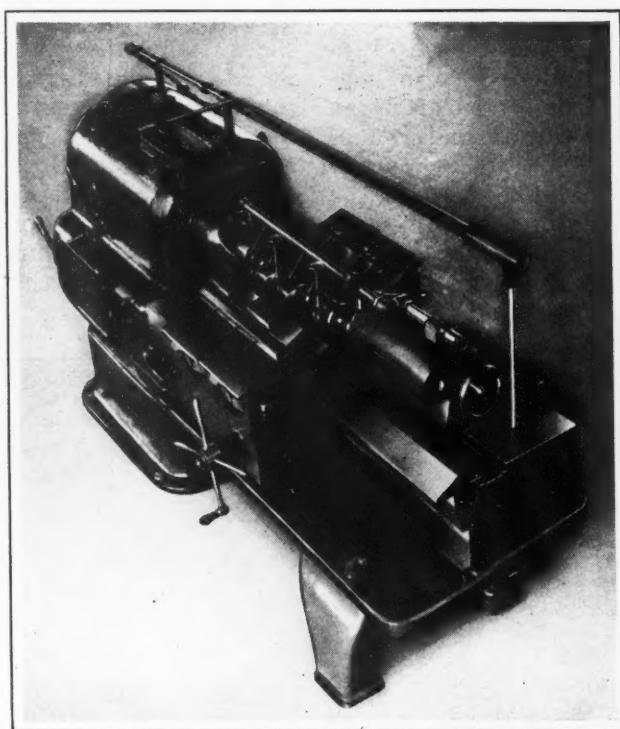


Fig. 4. Plan View of the Crankshaft-cheek Beveling Machine

Value of Exhibits to the Machine Tool User

By R. M. HIDEY, Works Manager, White Motor Co.,
Cleveland, Ohio

The machine tool exhibit has much the same value to the manufacturer and user of machine tools that the automobile show has to the manufacturer and user of automobiles. It permits a comparison of a great many types within a short space of time and at a relatively low cost. It enables executives to vision improvements made in machine tool equipment which affect both the production plants and the smaller shops.

The discussion of exhibits brings about an interchange of ideas and promotes association among machine tool builders and production executives which is most beneficial. These benefits can be obtained only when there are exhibits to be discussed.

Exhibits of machine tools also promote standardization of the machine tool builders' product and foster cooperation among builders—two important developments recommended in my paper on the "Machine Tool Needs of the Automotive Industry" given at the Machine Tool Session of the Society of Automotive Engineers' Production Meeting in Cleveland, September 15, 1925. It is gratifying to see the progress that is being made in these two particulars.

The machine tool exhibit is normally more constructive than the automobile show, because less emphasis is placed on the social aspects. As valuable as machine tool exhibits are, however, the very nature of the industry gives rise to a question in my mind as to the value of a yearly exhibit. It would be worth while to determine the relative value of exhibits held yearly, every eighteen months, or every two years, with local exhibits at frequent intervals on a smaller scale than a national exhibit. Permanent exhibits in localities where the number of machine tool builders and prospective customers warrant such exhibits, may be desirable.

By I. F. LINDBERG, Superintendent of Equipment and Maintenance, Allis-Chalmers Mfg. Co., Milwaukee, Wis.

At no time in the past have visits to machine tool expositions brought as much direct return to an equipment engineer or production manager as at present. This is because of the great improvements that have been made in machine tools in the last five years. No matter how well informed a man may be, it is not possible for him to keep abreast of all the improvements that have been made, and if he expects to keep up to date, he cannot afford to neglect the opportunity offered him to gain information and knowledge at a machine tool show.

It is no exaggeration to state that greater and more numerous improvements have been made in machine tools in the last five years than in fifteen years previous. These improvements relate not only to the design of machine tools as a whole, but also to special features, such as lubrication systems, heat-treated gears, spline shafts and im-

proved materials for shafts, and electrical control and drive.

Because of the important developments constantly made in the machine tool field, progressive concerns are sending a great number of men from their plants to machine tool exhibitions. Last year over twenty men from the different shop departments of the Allis-Chalmers Co. visited the machine tool show in Chicago, and it is expected that a large delegation will visit the machine tool and shop equipment shows this year. The visitor can learn a great deal more at a show than he can possibly learn from a salesman. At a show, the manufacturer of machine tools and shop equipment has an opportunity to demonstrate every advantage of the machine, and to show by actual performance, what feeds and speeds are obtainable on regular production work.

Briefly, I believe that the following points may be mentioned among the advantages gained by visiting machine tool and shop equipment exhibitions:

1. The educational value relates not only to new machines which the visitor sees for the first time, but also to the possibilities of machines already installed in the visitor's shop which may not be operated to the best advantage and about which the man visiting the show may learn some points of which he was not aware.

2. At the show the mechanical man will see many machines with which he ordinarily is not familiar, and their possibilities for work in his shop may become evident to him. For example, at the show in Chicago last year, the writer saw a milling machine that happened to just fit a manufacturing problem that at that time confronted him. It had not previously been realized that this particular machine could be used so advantageously for the operation under consideration.

3. The mechanical shop man meets machine and tool manufacturers and their representatives. This direct contact is of great value in many instances. Not only should the man who authorizes the buying of equipment visit the show, but the men who are responsible for the output in the shop—assistant superintendents, foremen, etc.—should be given an opportunity to go. As a matter of fact, the real value of a new machine can be obtained only when these men are fully familiar with it.

* * *

A leading automobile equipment engineer has suggested that when standard machine tools are furnished for a specific operation, it is advisable to remove from the machine all moving parts that are not required for the operation in hand. The parts that are not needed for the special work to be done should be sent with the machine tools, in separate containers, and should be accompanied by full instructions for their installation in case the machine should be used later for some other operation that would require these additional parts.



Design and Construction of Taps

With Special Reference to Taps Having Ground Threads—Construction of Hand Taps

By A. L. VALENTINE, Manager Tap and Gage Division, SKF Industries, Gothenburg, Sweden

IN the preceding articles of this series, inaccuracies frequently found in taps that are not ground in the thread after hardening have been discussed. The reasons for the development of the ground tap, tolerances, and other important considerations in the design and construction of taps have been dealt with, as well as the flutes in taps and other constructional features. The present article will deal mainly with the distribution of the work done by different taps in a set.

The Construction of Hand Taps

Ground taps are, on the whole, constructed in the same way as those not ground in the thread. In some cases, spiral flutes and relief right up to the cutting edge have been introduced as improvements.

Hand taps are generally made in sets of three—taper, plug, and bottoming taps. In Figs. 2 and 4 are shown the distribution of the work and the length of the chamfer on these taps. How the work to be done by each tap in a set of three is distributed is clearly indicated in the illustration by showing the appearance of the hole after it has been tapped by each succeeding tap in a set. The length of chamfer shown is in accordance with European practice, being 12, 5, and 1 1/2 threads, respectively, for taper, plug, and bottoming taps in a set of ordinary hand taps (Fig. 2), and 4, 2 1/2, and 1 1/2 threads, respectively, in a set of "serial" hand taps for bottoming holes (Fig. 4). These lengths of chamfer correspond approximately to 3, 7 1/4, and 23 1/4 degrees angle of chamfer, respectively, on ordinary hand taps, and 5 1/2, 12 3/4, and 23 1/4 degrees on hand taps for bottoming holes.

Regular hand taps are recommended for tapping through holes only. To show their unsuitability for tapping bottoming holes, they are shown in Fig. 2 for tapping such holes; their action should be compared with that of taps specially designed for that purpose, as shown in Fig. 4. They are unsuitable for bottoming holes, not only because of the equal diameter of the respective taps in a

set and their length of chamfer, but also on account of their generally unsuitable form of flute for bottoming holes, as mentioned in a previous installment.

In a set of ordinary hand taps, every tap has the same diameter, the only difference being the length of the chamfer. Hand taps for bottoming holes (Fig. 4), on the other hand, are not only especially designed for that purpose, but are suitable for tapping somewhat longer than ordinary through holes as well, which produces greater strain on the tap. They have not only different lengths of chamfer, but each tap in a set has a different diameter in all elements, so that the taper tap only roughs out the hole, leaving a partially finished thread in it; the plug tap enlarges the hole still more, but leaves it with an unfinished thread; and the bottoming tap cuts a full thread.

The formulas, according to which the different diameters of the taper and plug taps are determined, are as follows, for the United States standard thread:

Outside diameter of taper tap equals nominal outside diameter of tap minus 0.52 times pitch;

Pitch diameter of taper tap equals nominal pitch diameter of tap minus 0.16 times pitch;

Outside diameter of plug tap equals nominal outside diameter of tap minus 0.13 times pitch;

Pitch diameter of plug tap equals nominal pitch diameter of tap minus 0.08 times pitch.

For the Whitworth form of thread, the formulas are the same as those given for the United States standard form of thread, the only difference being that the outside diameter of the plug tap is made equal to the nominal outside diameter of the tap minus 0.17 times pitch.

Referring now in detail to Fig. 2, A shows an ordinary set of three hand taps for a Whitworth thread used for a bottoming hole. The taper tap has a chamfer angle of 3 degrees, the chamfer in this case affecting 12 threads. The plug tap has a chamfer angle of 7 1/4 degrees equal to a chamfer of 5 threads. The bottoming tap has a chamfer angle of 23 1/4 degrees equal to a length of cham-

fer of $1\frac{1}{2}$ threads. At *D* is shown the thread after the taper tap has been used; at *C* the thread after the plug tap has completed its work; and at *B* the finished thread after a cut has been taken by the bottoming tap.

It should be noted that when a set of taps of this construction is used for tapping a through hole, the plug and bottoming taps have no work to perform, as the taper tap, when it has passed entirely through the work, has completed the thread. At *m*, *n*, and *o* are shown the different cross-sectionings used to indicate the metal removed by the different taps. The cross-sectioning indicated at *m* shows the metal removed by the taper tap when threading a bottoming hole; *n*, the work performed by the plug tap; and *o*, the work performed by the bottoming tap.

At *E*, Fig. 4, are shown the conditions when a bottoming hole is threaded with what is known as a set of "serial" hand taps, in which only the bottoming tap is made to the full diameter on an element. Here the taper tap has a chamfer angle of $5\frac{1}{2}$ degrees, or a chamfer of 4 threads; the plug tap, $12\frac{3}{4}$ degrees, or $2\frac{1}{2}$ threads; and the bottoming tap, $23\frac{1}{4}$ degrees or $1\frac{1}{2}$ threads.

The cross-sectioning shown at *m*, *n*, and *o* indicates the metal removed in threading a bottoming hole by the taper tap, the plug tap, and the bottoming tap, respectively; *K* shows the appearance of a bottoming hole after having been threaded with a taper tap; *J*, the appearance after the plug tap has completed its work; and *I* shows the completed thread produced by the bottoming tap.

L shows the conditions existing when a serial hand tap is used for threading a through hole, the taps used being identical with those shown for threading a bottoming hole at *E*. At *H* is shown the appearance of the thread after the taper tap

has passed through it; at *G*, after the plug tap has been used; and at *F*, the completed hole after the bottoming tap has finished the thread. The cross-sectioning indicated at *p* shows the reduction in the work of the plug tap in a set of serial hand taps when threading a through hole, in comparison with a bottoming one, and *r* indicates the reduction for a bottoming tap in a set of serial hand taps when threading a through hole, in comparison with a bottoming one. It should be observed how much less work the plug and bottoming taps have to perform when threading a through hole, as at *L*, than when threading a bottoming hole, as at *E*.

New Types of Ground Thread Taps

The grinding of the threads in taps has suggested many new developments and studies in tap construction, and some of the taps produced in accordance with what has been thus discovered are shown in Fig. 1.

The taps shown at *A* in Fig. 5 are intended for tapping through holes, and the taps shown at *B*, for tapping bottoming holes. Those shown at *A* are an improvement on the so-called "gun-tap" illustrated at *C*, which was developed in the United States during the early part of the War and found particularly suitable for tapping through holes in tough materials. It is conceded that the ordinary gun tap, as well as those shown at *A* and *B*, do not produce as fine and smooth a thread as ground spiral-fluted taps with a less marked angle of spiral but these taps have the advantage of pushing the chips ahead of them, thus materially reducing the risk of tap breakage on account of the chips clogging. The tap shown at *A* has an advantage over that shown at *C* in that it is easier and cheaper to sharpen correctly; and when sharpening, the correct flute form, cutting angle, and

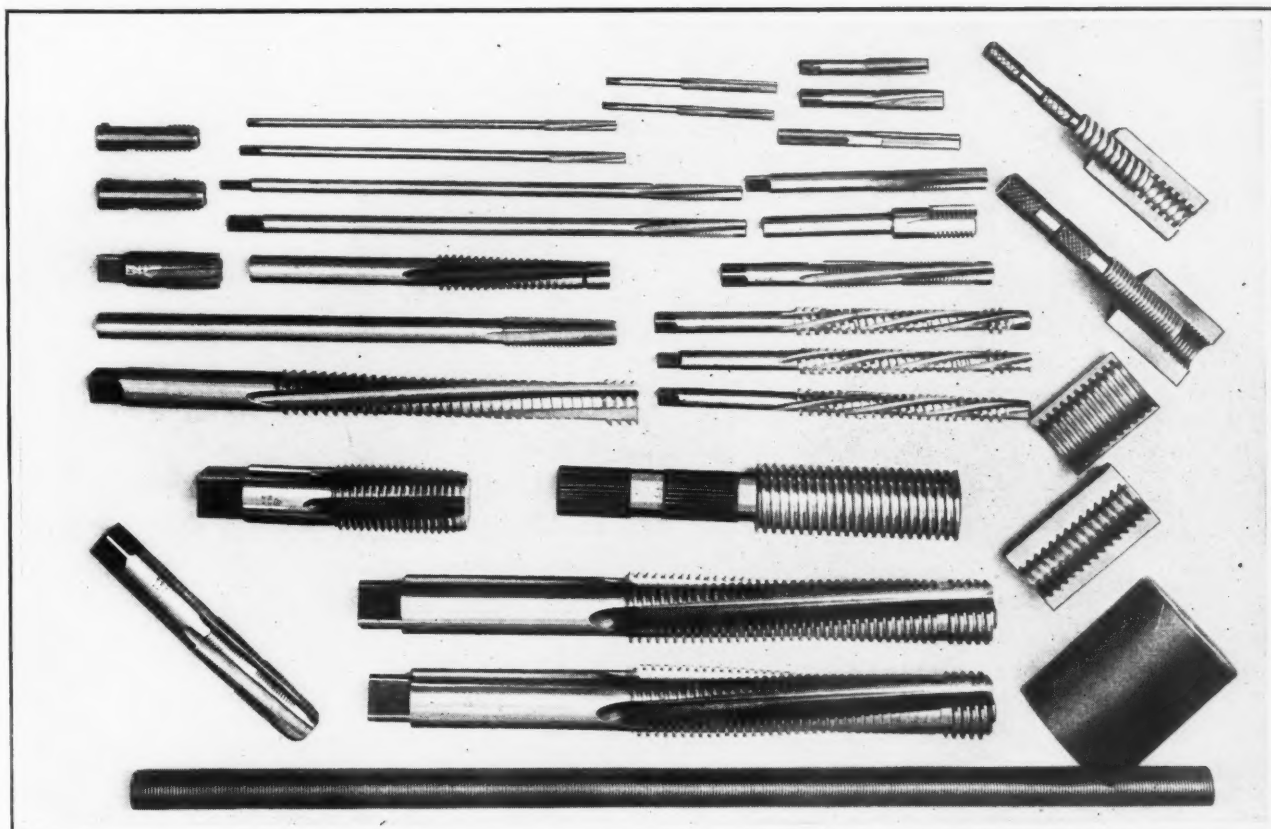


Fig. 1. A Collection of Ground Thread Taps

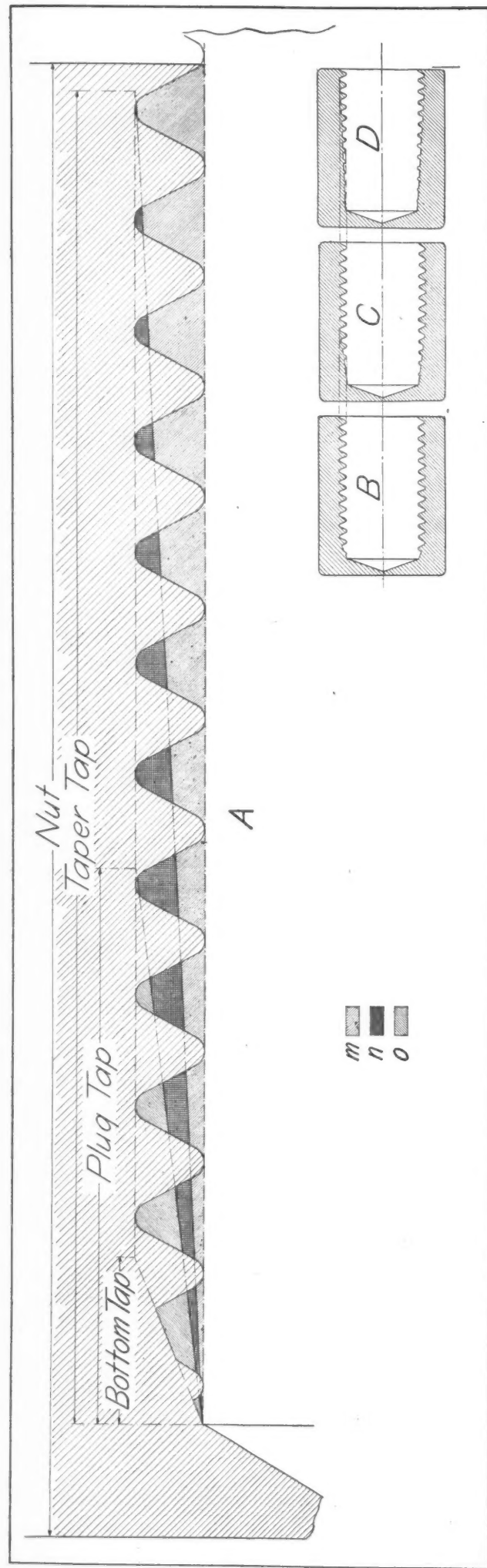


Fig. 2. Distribution of Work Done by a Set of Ordinary Hand Taps when Tapping a Bottoming Hole

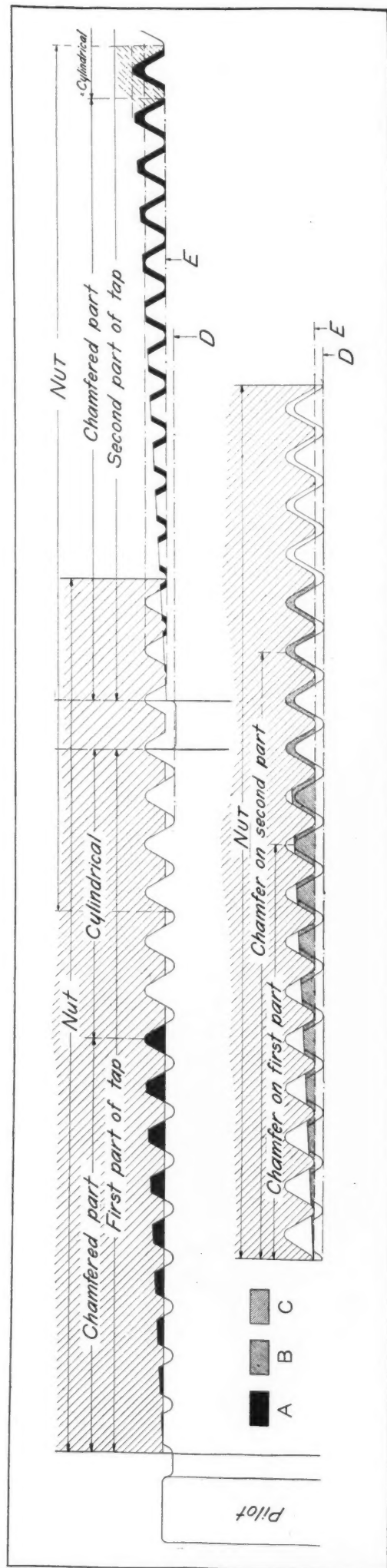


Fig. 3. Sectional View, Showing in Detail the Distribution of the Work Done by the Threads in a Tandem Tap

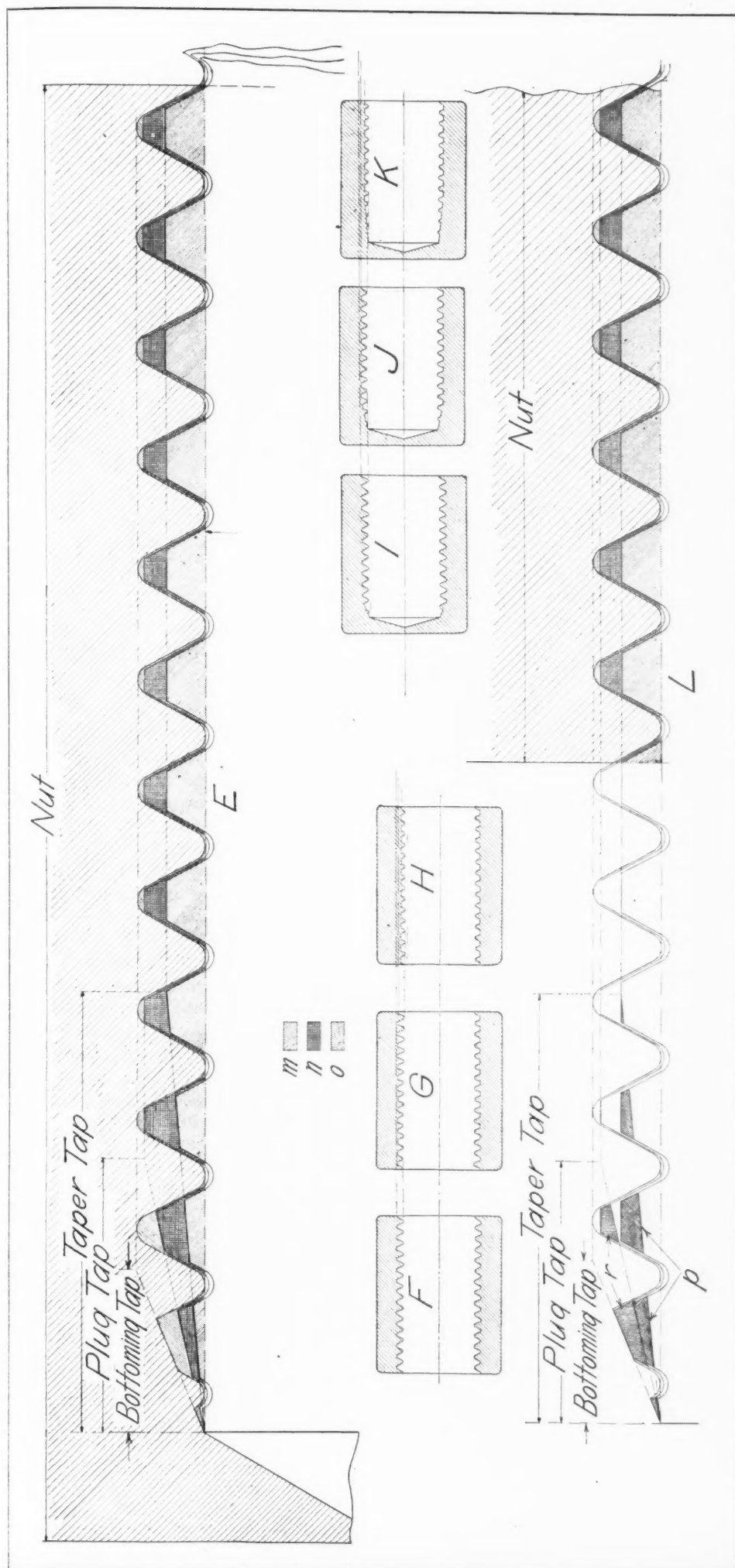


Fig. 4. Distribution of Work Done by Different Taps in a Set of Serial Hand Taps when Tapping a Bottoming and a Through Hole

rake are easily maintained. Taps such as shown at B, for bottoming holes, tend to pull the chips upward toward the shank, like a twist drill, and hence, the chances of the tap breaking, because of the chips clogging in the flutes or collecting in the bottom of the hole, are materially reduced.

Tandem Taps

Figs. 3 and 6 show the so-called "tandem" tap which has been found to work particularly well in

tapping long through holes by machine. This type of tap consists of two threaded parts separated by a small recess. The first part is preceded by a pilot, the diameter of which is equal to the root diameter of the hole to be threaded. Both threaded parts are exactly alike, except that the part nearest the pilot is made a certain amount under size, leaving to the part nearest the shank the work of finishing the thread in the hole. Such taps produce holes with correct thread form and diameter and with

very fine thread surfaces. Much time is also saved in handling the tools, because two taps are, so to speak, mounted on one shank. This feature is also economical in that it reduces the number of taps required, one tap being sufficient for finish-tapping a hole. The tandem type of tap also prevents the reaming of the hole to be tapped by the chamfered part of the first tap in a set, because this form of tap gets a grip on the hole more readily than ordinary taps.

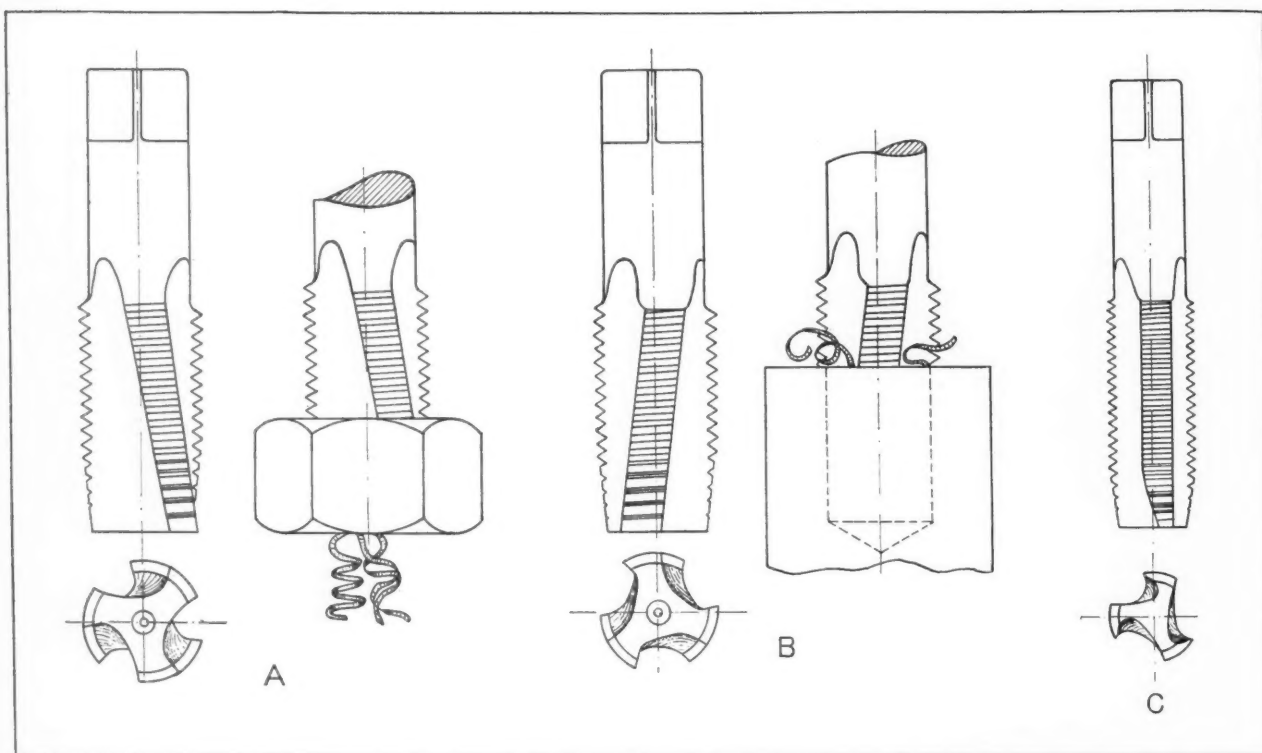


Fig. 5. Special Taps for Threading Through and Bottoming Holes

In Fig. 6, the enlarged section of the thread at A shows the amount of work done in producing a thread by sections *b* and *d* of the tap. Fig. 3 shows how the work of threading is divided between the threads in a combination tap such as shown in Fig. 6. The length of the nut is assumed to be $2\frac{1}{4}$ times the diameter of the tap. The black parts of the thread show the cut taken by each part of the tap. The diagram at the bottom in Fig. 3 shows the same nut and tap as the diagram at the top, but the threads of the two portions of the tap have been superimposed upon each other to show more clearly the work done by each part of the tap. The cross-sectioning indicated at B shows the work done by the first section of the tap, and that at C, the work done by the second section of the tap. In both diagrams, D indicates the root diameter of the first part of the tap, and E the root diameter of the second part of the tap and of the nut.

* * *

Production executives are looking with great favor upon the increasing use of anti-friction bearings in machine tools. One equipment engineer recently mentioned that there are still many places where such bearings can be applied in place of plain bearings. "Gradually," he said, "I expect to see anti-friction bearings applied to all important bearings in machine tools."

AN EFFORT TO REGULATE ENGINEERING CORRESPONDENCE SCHOOLS

The American Association of Engineers, 63 E. Adams St., Chicago, Ill., at its annual convention at Tulsa, Okla., took steps to promote laws to place correspondence schools giving instruction in engineering under the same federal and state laws as resident schools and other institutions of higher education. A resolution was adopted which states that while the association approves the principle of education and training by correspondence, it emphatically objects to the questionable practices sometimes found in the correspondence school field, and insists that such schools, and particularly those specializing in engineering and professional subjects, shall be required to operate under supervision and regulation equal to that now prescribed by federal law or state statutes for resident schools, "to the end that the abuses now existing in the field and being so widely complained of, may be eliminated and that the text-books and courses of such schools shall be up to date, accurate, and thorough, written by leaders in their professions, and taught by men and women of education, training, and experience, so that graduates of correspondence school courses shall be qualified to render the maximum of service in their chosen professions or fields of activity."

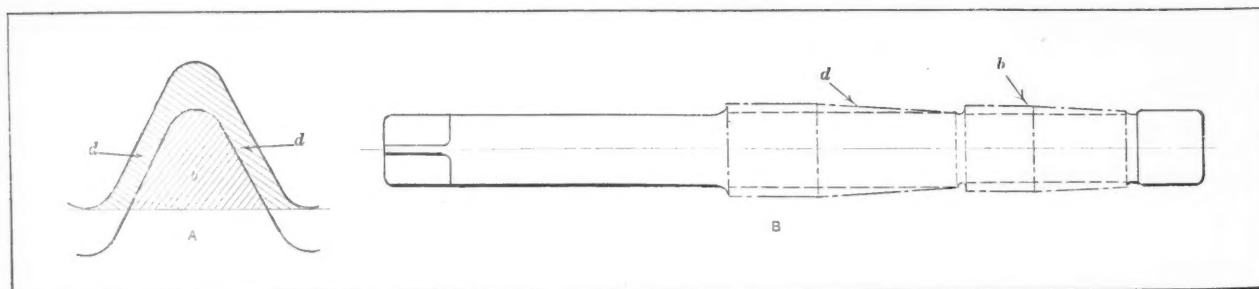


Fig. 6. Design of Tandem Taps and the Distribution of the Work Done by Each Tap

What MACHINERY'S Readers Think

Contributions of General Interest are Solicited and Paid for

GUARDING PATENTABLE IDEAS

The method of insuring the rights of inventors by making a sketch and then having it witnessed, mentioned in the article in June MACHINERY, page 781, is very good. There is, however, another method that has been used successfully and that requires no witnesses.

Make a tracing and a blueprint—several, if necessary—showing the invention. Fold the blueprint neatly, so that it can be mailed without using an envelope; then write your own name and address on the back of the blueprint, put a postage stamp on it, and drop it in a letter box. When it comes back to you, you have a blueprint stamped on the back with the cancelling date stamp of the post office, giving location, day, month, and year in a manner that no one can dispute. When this idea is employed, it is unnecessary to trouble anyone to be a witness. Of course, one should sign one's own name on the original tracing.

A. W. JANSSON

STIMULATING INTEREST IN SHOP WORK

The article entitled "Stimulating Interest in Shop Work," by H. W. Morley, in May MACHINERY, brings to mind a system used to advantage in a machine tool shop in Baltimore. For several years we had noticed that our apprenticeship system gave us only a fair grade of mechanics, the percentage of high-class capable men being very low; the majority were hardly what could be termed fair. So we devised a plan of examining applicants, and as we always had a waiting list (something almost unknown today) we selected those boys who passed this test with the highest average. After a boy had been placed in the plant by this method, we endeavored to have him take up the study of drawing at night.

At different times, we created a simple mechanical problem as, for example, calculating the gearing ratio for screw cutting or finding pulley dimensions from given sizes and revolutions per minute. To the boys who gave the best and clearest answers we presented a mechanical book. We followed their actual work with real examples, showing how results were accomplished with varying speeds and feeds for different metals, always using a good text-book. It soon became apparent that we were getting better mechanics and better production because the boys operated their machines intelligently. We particularly noticed that great interest was centered on milling machine problems, and these were usually followed by questions, dug up by the boys themselves, who were anxious to succeed.

Our admission examination was very simple, designed for a person who had about six years' schooling, but it really was surprising how few received 80—the necessary average for passing. A few typical questions will give an idea of the

simplicity of the examination. "How many times will a wheel turn in 1 1/2 hours, if it turns twenty times a minute?" and another, "What is the product of $0.375 \times 1/2$?"

It is well known that all or nearly all large plants today are using some method among their apprentices to stimulate interest, and it pays dividends to do so.

RAYMOND H. DAUTERICH

INCREASING TOOL-ROOM EFFICIENCY

The article entitled "Increasing Tool-room Efficiency," on page 609 of April MACHINERY brings up some debatable points. The treatment of the subject is inclined to stress the point of view of a production manager of strictly production work, rather than the point of view of a toolmaker. It is true that some phases of modern toolmaking can be successfully placed on a production basis, particularly in large plants that require quantities of certain tools and fixtures for replacements and where it is essential to have large stocks on hand. In cases of this kind, certain parts or operations on various small tools such as taps, dies, reamers, milling cutters, etc., can be produced under production methods by unskilled or semi-skilled operators. Such work can be speeded up to the limit with fairly good results.

When we think of toolmaking, we generally associate the idea with fine precision work that requires extra skill and experience, such as dies, gages, jigs, fixtures, and a great variety of special tools. On such work, experience frequently demonstrates that haste makes waste; and attempts to speed up the class of men who are employed on expensive work have on many occasions proved to be false economy. Ordinarily, the average first-class toolmaker is a conscientious worker and takes a great deal of pride in turning out high-grade work. Anyone who has had dealings with this type of mechanic knows that he has a speed limit, and it is often that speed limit that saves many thousands of dollars for the firm. If you want a quality product, you have to expend more time on it, in comparison with manufactured parts. There is, of course, a great waste in unnecessary machine work on some tools, but this is a fault of the designer rather than the toolmaker. Certainly, there is much room for the practice of economy in many shops in this direction. There is at present a marked tendency to get away from so-called "frills," and this makes for real economy in the cost of tools.

H. WHEELER

The remarks on tool-room efficiency in April MACHINERY were interesting to me, and while agreeing with the author that there are tool-rooms where the conditions are as he states, I think he is claiming too much in saying that 50 per cent of the tool-rooms are operated inefficiently. From my

personal experience I know that it is impossible for the tool-room to approach the production department in quantity of output, but there is just as much efficiency and output per man, if due consideration is given to the value of the work turned out and not to quantity alone.

Here are a few reasons why tool-room work always looks slow, when compared to the production departments: There is seldom the volume of work of the same kind in the tool-room to institute production methods. By the time the toolmaker has all the necessary tools together, the job is finished. Up to this point, the toolmaker's job would compare favorably with the production departments' set-up time. Operations that form a large part of tool-room work are turning and threading special taps and hobs and turning plug and ring gages. It would be impossible to turn these out at fast speeds and secure the accuracy and smooth perfect threads required.

In the majority of instances, the material used in the tool-room is harder than that handled in the production departments, and consequently, more difficult to machine. In setting toolmaker buttons to bore holes in jigs, care and patience are required to a degree that makes it impossible to speed up. On the shaping and planing operations on jigs and fixtures, there are many instances where awkward settings often make it impossible to clamp the work securely.

While, of course, feeds and speeds should be as great as possible, it is essential that care be taken not to move or spring the part while machining. It is not good policy to take the heavy cuts and feeds on tool-room machines that are employed on production machines. The pitch of a lead-screw on a tool lathe, for instance, would soon be useless for thread gage cutting, if it were subjected to the heavy, coarse feeds, at fast speeds, used in production. With regard to the machining of portions of a jig or fixture that are not important and could be left rough, most tool-rooms have eliminated this source of lost time long ago.

ARTHUR SILVESTER

A HELPFUL ENGINEERING COLLEGE COURSE

Among my recollections of college days is the admonishment "Hew to the line, let the chips fall where they may," or, to put it more literally, the civil engineer should launch his career with the transit, the electrical engineer in a power plant, and the mechanical engineer on the drafting-board. Faithful to the professorial tradition, the young engineers usually find themselves, after some years, professional, but not financial, successes in already overcrowded fields. Then come the inevitable stock takings; those who have been keeping their eyes open and watching the chips, and who are in a position to start over in the many allied fields of endeavor (in which their engineering education is an indirect but not a direct asset) do so.

The remedy is any logical means of preventing the postponement of this facing of the facts to such a late date that family responsibilities or individual pride prohibit the taking of a chance when the truth dawns. A short course for seniors on "Engineering Opportunities" would be a great help. The

data for this course could be obtained from the past graduates of the institution. Primarily, it would take up, in logical sequence and grouping, the activities of graduates of that particular course, building up statistics as to incomes, opportunities, special qualifications, and methods of procedure to enter a particular field. In addition to its direct information, it would have a broadening influence on students and faculty alike—and it would furnish the faculty with just that contact with the outside world, the lack of which they so sincerely deplore.

Perhaps I am too enthusiastic in my imagination, but I believe that in due time such a course would extend its influence to other courses in the curriculum, replacing those that are taught for "mental discipline" or remain through tradition, though the subject is so highly specialized that not a hundred men in the whole United States actually devote their energies to it. Surely it would be a worthwhile experiment for some institution to undertake.

LEWIS J. YAPP

SCHEDULING ESTIMATES

In an industry where time is often of as much importance as cost—for example, in the aircraft industry—the time factor must definitely be considered in estimates for the manufacture, repair, or modification of an airplane; hence, estimates are generally expected to give both cost and completion date. The manufacturer, realizing the importance of the time element in the final awarding of the contract, offers the best possible delivery date he can.

Of the many jobs on which he estimates he realizes that he can get but a small percentage; and with this factor working in his favor, he is tempted to give his best possible time on each job. But there is the ever-present danger that he will be awarded several contracts, all of which would have to run through the shop at the same time; and while he may be able to increase his force somewhat, he is quite likely to run into congestion in his engineering and planning department and be delayed in the procurement of materials.

One manufacturer solves this problem nicely by adding to the individual schedules maintained in each department of his plant, for the producing members of that department, entries in red showing just what men would work on the proposed job, and when, if the contract is obtained. In submitting his estimates, he always makes his delivery dates contingent upon receiving the order on or before a certain date. If the order is not received within one week after this date, it is automatically removed from the man-schedules. If it is received in time, the schedule entries are merely converted from red to black, indicating that they refer to an accepted order.

Thus, when he has too many estimates out, his schedules give him warning, and he can either extend his estimated delivery date on new estimates, or better yet, find out through telephone or mail if outstanding estimates are still open and unawarded. By the use of this simple system, embarrassing situations are readily avoided.

M. A. MILLS



The Wright Whirlwind Engine

Constructional and Operating Features of the Engine Made Famous by the Recent Transatlantic Flights—Second Article

By FREEMAN C. DUSTON

PROBABLY few people outside the engineering field have any conception of the vast amount of work back of the engine that made possible the transatlantic flights. The construction and operation of this engine hold much of interest to men in all branches of the machine-building industry. The cross-sectional views of the "Whirlwind" engine, Figs. 20 and 21, show unique assembling methods which permit various important units to be removed for inspection without disturbing other members.

The mechanisms that cause certain members to function at predetermined periods or intervals of the operating cycle are interesting examples of gear and cam combinations. In addition to showing features of interest to machine designers and shop men, Figs. 20 and 21 will also help the reader obtain a better general knowledge of the operating principles of this type of engine, which in many respects represents a wide departure from the "in line" and V-type engines with which we are familiar. In this article brief explanations are given of the functions of certain important parts of the engine that might not be clearly understood from the illustrations, together with descriptions of machining operations in the plant of the Wright Aeronautical Corporation at Paterson, N. J., where the production of the "Whirlwind" engine is now being rapidly increased.

With the rapid expansion of the aircraft engine industry, machine tools of special and highly developed types will doubtless be required, as in the case of the automobile industry. Some idea of the important part standard machine tools now play in producing the "Whirlwind" engine is given by the illustrations and brief descriptions of machining

operations in this article and in the previous article published in July MACHINERY.

Features of Assembly

In Fig. 22 is shown the partially assembled crankcase, crankshaft, and connecting-rods. The fine finish given the various parts is not merely for the sake of appearance, but is necessary to meet the exacting inspection and rigid tests of the builders and the Navy Department inspectors. Reference to Fig. 20 will show how the five sections that compose the complete crankcase are assembled.

The engine is secured to the fuselage mount by eight 3/8-inch steel bolts. At A, Fig. 22, is shown the drilled hole for one of these fastening bolts. A close inspection of Figs. 20 and 21 will show that the parts are so assembled that the cylinders, the oil-pumps, magnetos, carburetor, various sections of the crankcase, and in fact, almost every part of the engine can be removed for inspection or replacement without disturbing other important parts.

Cylinder Assembling Operations

In July MACHINERY, reference was made to the assembling of the aluminum alloy cylinder head on the cylinder barrel. This is accomplished by screwing the forged steel barrel into the cast aluminum head for a distance of 1 3/32 inches with a shrink fit.

The intake and exhaust valve guides of extruded aluminum bronze and S.A.E. 71660 steel, respectively, are shrunk into the cylinder head. Two bronze spark plug bushings are screwed and shrunk into opposite sides of the head. The flange G, Fig. 20, on the aluminum bronze shrunk-in valve

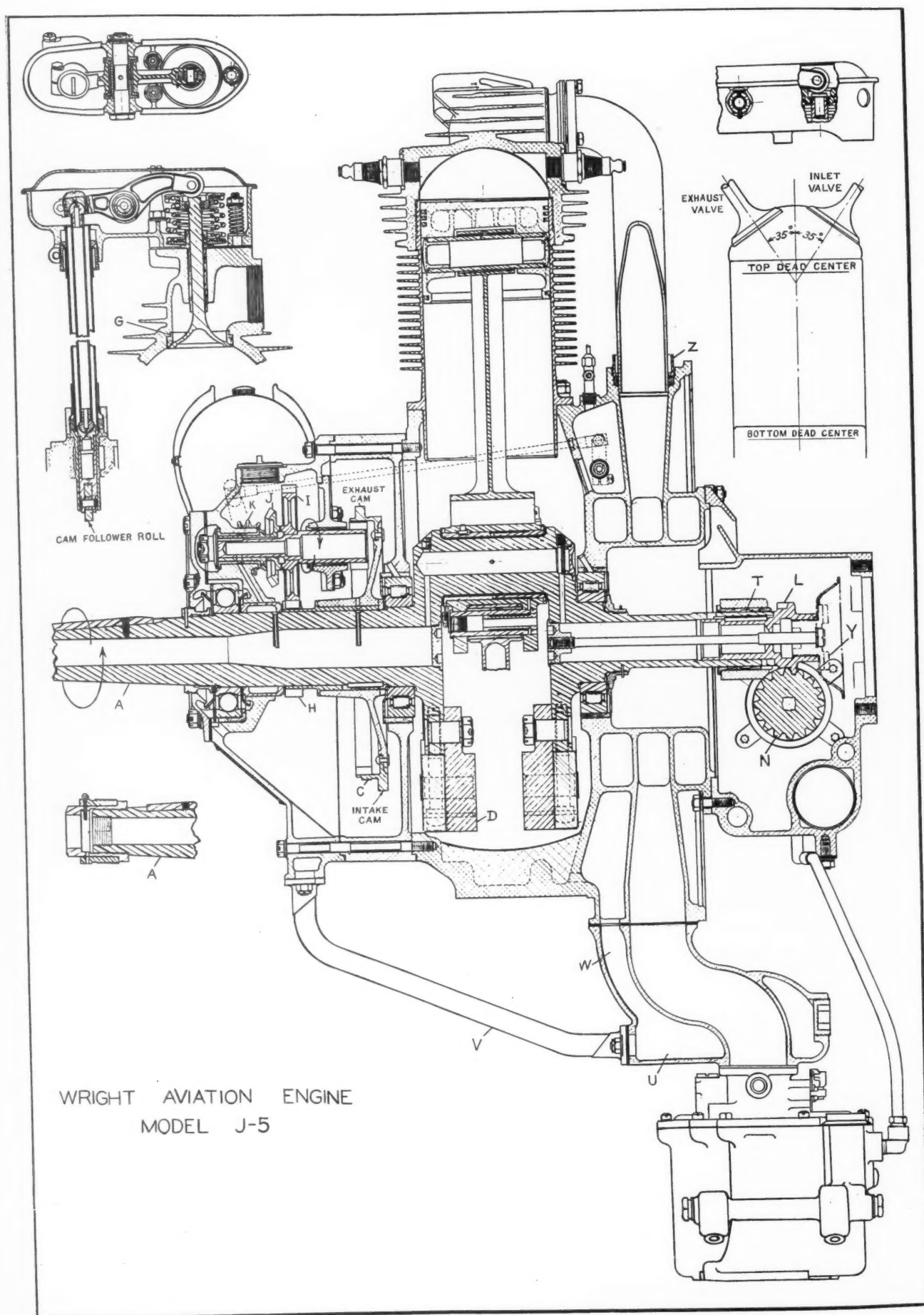


Fig. 20. Transverse Section Assembly of 200-horsepower Wright "Whirlwind" Engine

seat is rolled into an under-cut in the cylinder head casting with the tool shown in Fig. 9, page 808, of the previous installment of this article in July MACHINERY.

Balancing the Crankshaft

The single-throw crankshaft is machined all over to close limits from a chrome-nickel steel forging. After bolting the counterweights *D*, Fig. 20, to the

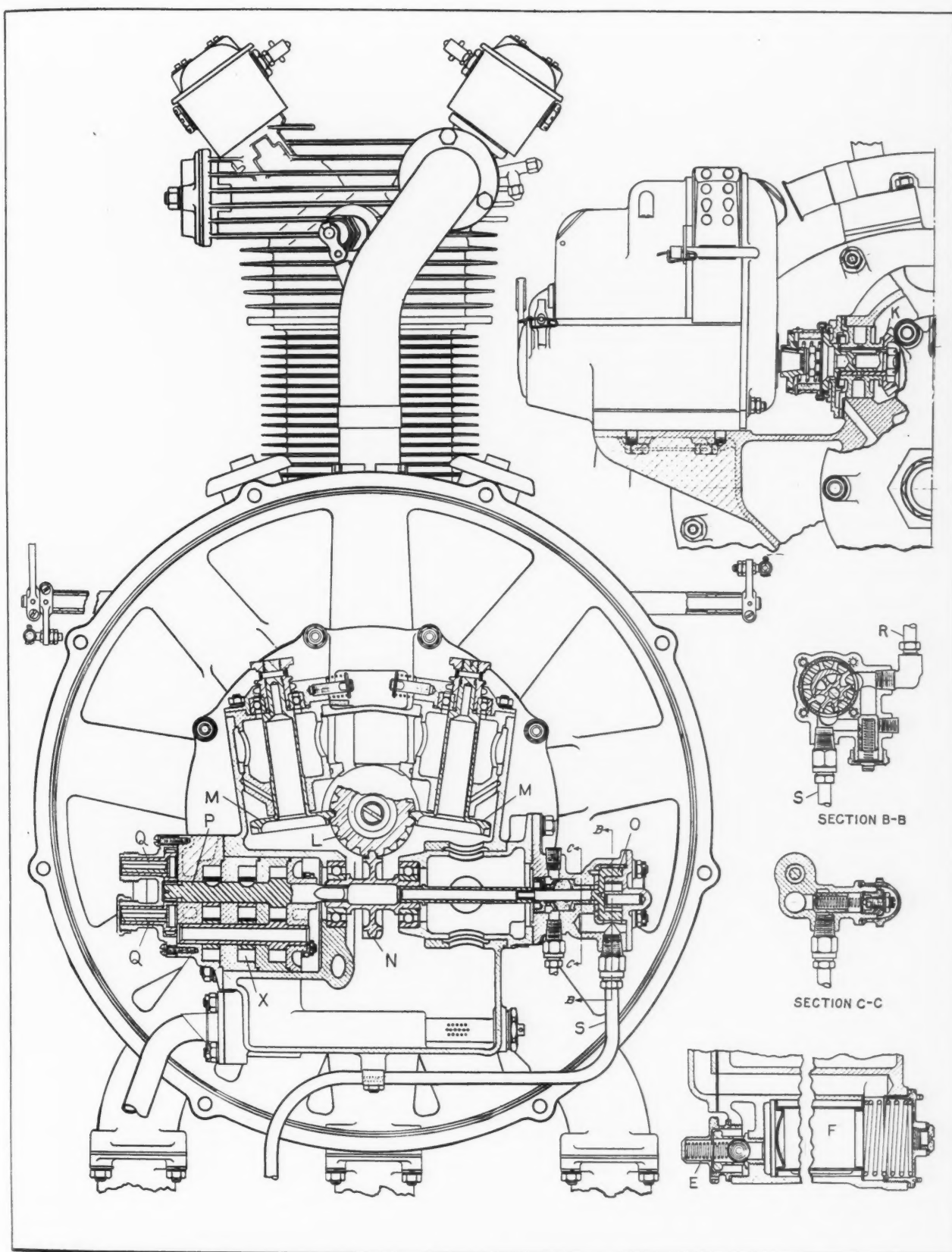


Fig. 21. Assembly Section View through Accessory Drive

crankshaft cheek extensions, a cylindrical balancing weight, which represents the effective weight of the piston and connecting-rod assembly, is secured around the crankpin bearing, and the crankshaft is placed between the centers of an engine lathe. The counterweights are then turned down to within 0.005 inch of the point where, according to predetermined figures, they should balance the crankshaft. The final balancing is done on a precision balancing machine. The master rod and the

articulating rods are held within close limits on weight, and selective grouping during inspection is employed to obtain as perfect balance as possible.

Crankshaft Bearings

The crankshaft runs in four bearings—the ball thrust bearing at the propeller end, the two main roller bearings, and a plain bearing in the rear section where the oil is admitted. At Y is the

starter dog, which is provided for making connection with any one of several types of starters which may be bolted to the machined face just behind the starter dog.

Gear Drive for Cam

Reference to Figs. 20 and 24 will make clear the functioning of the mechanism that causes the inlet valve in each cylinder to open and close once every two revolutions of the crankshaft to admit gas from the carburetor, and also causes the exhaust valve to open and close once every two revolutions of the crankshaft at the proper time to allow the outward moving piston to expel the burnt gases. Referring to Fig. 24, the intake cam is shown at *G* and the exhaust cam at *F*.

Now referring to Fig. 20, gear *H*, having twenty-four teeth, is fastened to the crankshaft. This gear drives the thirty-two-tooth gear *I* on a shaft having a ten-tooth pinion which meshes with the sixty-tooth internal gear of the cam ring *C*. The gear train thus drives the cam at one-eighth the speed of the crankshaft and in the opposite direction. As there are four lobes on each of the cam profiles, the valves in each cylinder will be opened and closed once every two revolutions of the crankshaft, as required.

Machining and Assembling Valve-operating Cam

The assembled valve-operating cam shown at *C*, Figs. 20 and 24, consists of an aluminum alloy hub *B*, Fig. 24, and the hardened and ground steel ring *A*. The rough forging from which this ring is machined is shown at *E*, Fig. 23. The first machining operation is performed on a double-spindle turret lathe, which finishes the part as shown at *D*.

After cutting the gear teeth on ring *D*, the profile of the four-lobe exhaust cam *F*, Fig. 24, is generated on a gear shaper equipped with a special form cutter. During this operation, the cam and cutter

revolve on fixed centers, the cam being held in a special fixture. After cutting cam *F*, the ring is reversed in the fixture and the profile of the intake cam *G* is formed in the same manner.

The cam profiles are ground, one at a time, on the Landis back-gear headstock grinder shown in Fig. 25, after the hub *B*, Fig. 24, has been pressed into ring *A* and secured by sixteen rivets, as shown at *C*. The grinder is equipped with a special holding fixture and a master cam at the rear end of the spindle, which gives the work the movement required to grind the cam profiles to shape. After one profile is finish-ground, the fixture is indexed to bring the other profile into position for grinding.

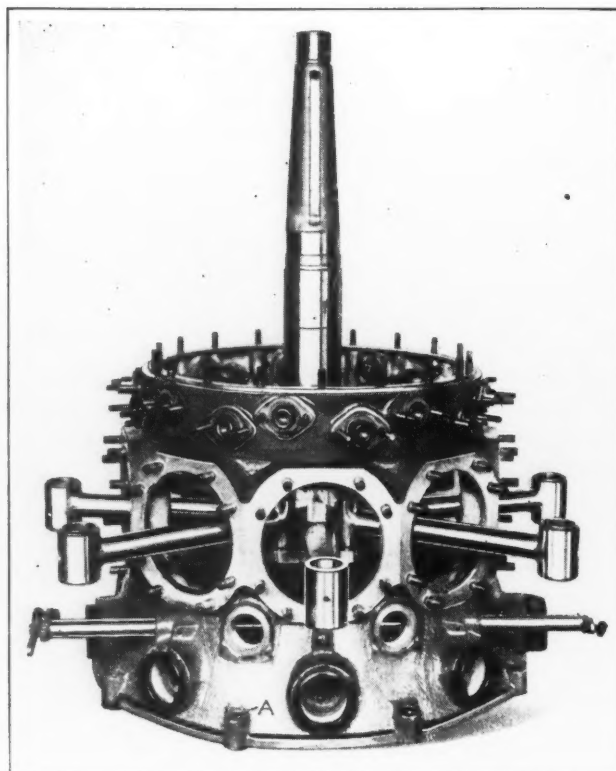


Fig. 22. Partially Assembled Crankcase, Crankshaft, and Connecting-rods

Gear Drive for Ignition System

At the left of gear *I*, Fig. 20, and keyed to the same shaft, is a twenty-seven-tooth bevel gear *J* which drives the two ignition magnetos located on each side of the front section of the crankcase, as shown in July MACHINERY. The gear on one of the magneto shafts is shown at *K* in Fig. 20 and 21. As each of the driven gears *K* has eighteen teeth, the magneto shafts turn $1 \frac{1}{8}$ revolutions per revolution of the crankshaft.

Now as the contact breaker cam on each magneto shaft has four lobes, the igniting circuit will be closed at intervals, determined or timed by a rotational movement of the crankshaft through an arc of 80 degrees, which is equal to twice the angular spacing between the axes of the nine cylinders. Thus, the firing order of 1, 3, 5, 7, 9, 2, 4, 6, 8 is obtained. The magneto distributors which provide for carrying the igniting current to the spark plugs of the proper cylinder in the order given are driven by their respective breaker shafts, through gears having the proper ratio and timing to complete the two circuits to the spark plugs of the proper cyl-

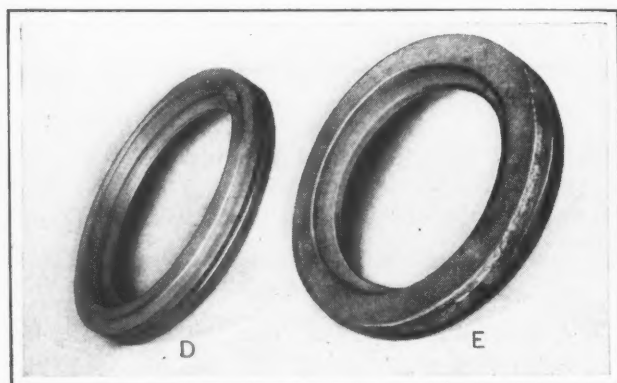


Fig. 23. Rough and Machined Forging for Cam Gear Ring

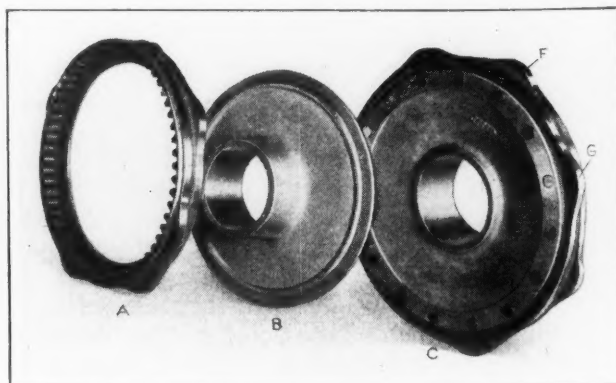


Fig. 24. Cam Gear Ring Assembled on Aluminum Hub

inder simultaneously with the closing of the circuits by the breaker cams. The advancing or retarding of the spark is obtained by moving the breaker assemblies of the two magnetos simultaneously about the breaker cams. The two magnetos which are thus perfectly synchronized deliver igniting current simultaneously to different spark plugs located on opposite sides of the same cylinder.

Drive for Gun Synchronizers and Pumps

At *L*, Figs. 20 and 21, is a helical gear which is secured to the rear end of the crankshaft. This gear drives the two gears *M*, Fig. 21, of the gun synchronizing mechanism which prevents bullets fired from the machine gun through the sweep of the propeller from hitting the blades. Gear *L* also drives the gear *N* which, in turn, drives the rotating member *O* of the fuel pump and the shaft *P* carrying the driving gears of the three pumps of the lubricating oil pressure and scavenging system. Pinion teeth cut on the end of shaft *P* drive the two tachometer gear shafts *Q*.

An interesting point in the design of these gear-driven units is that any of the units can be easily removed for inspection or replacement without disturbing the others. The gun synchronizer shafts and the oil and fuel pump shafts run at the same speed as the crankshaft, while the tachometer shafts run at one-half the crankshaft speed.

Fuel Supply Pump

View *B-B*, Fig. 21, shows a section through the pump which draws the fuel from the tank through pipe *R* and discharges it through pipe *S* to the car-



Fig. 25. Grinding the Four-lobe Profiles of Cam

buretor float chamber. Section *C-C* shows the pressure relief valve, which can be adjusted to give any desired pressure in the discharge line to the carburetor float chamber. Section *B-B* also shows the by-pass valve which permits the operator to pump fuel to the carburetor by the hand pump without forcing it through the pump gears.

Pressure Oil System

A vital factor in the operation of airplane engines is the lubricating oil system. If this fails to function, the engine cannot continue to operate. The oil is drawn from the bottom of an external tank by one of the three gear pumps of shaft *P*, Fig. 21, and delivered to the annular groove around the rear plain crankshaft bearing at *T*, Fig. 20, where it enters the hollow crankshaft at a pressure of 60 pounds per square inch under normal operating conditions. A pipe line connected with a gage on the instrument board enables the operator to check up on this pressure at any time. The operating limits range between 50 and 75 pounds per square inch, and if the pressure should fall below 35 pounds per square inch, the engine must be stopped immediately.

Radial holes drilled in the hollow crankshaft supply oil to the connecting-rod crankpin bearing, to the cam bearing, and to passages near the front end of the crankcase which lead to the magneto drive bearings. Holes through the connecting-rod bearing shell convey the oil through passages to the knuckle pins and thus to the knuckle pin bearings.

The various gears, shafts, and bearings in the crankcase rear section

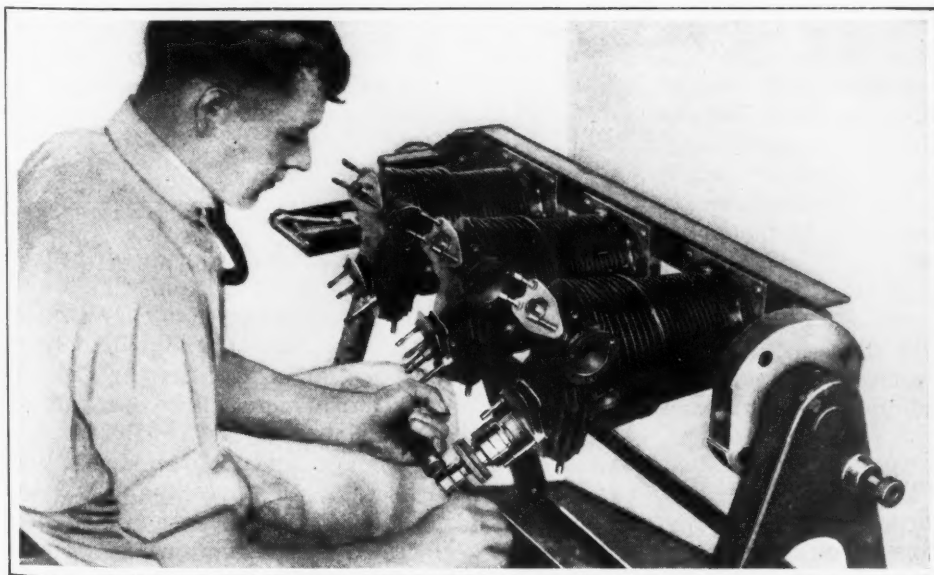


Fig. 26. Cutting Valve Seats with Hand Tool

are lubricated by oil, which is sprayed from the rear crankshaft bearing. Passages in the front section lead oil to the cam drive shaft and magneto shaft bearings, the spray from these and the cam bearing being utilized to lubricate the gears and valve tappets. Cylinders, pistons, and piston-pins are lubricated by spray from the crankpin bearing. Rocker arm pins are provided with "Alemite" grease gun connections. The hot, used oil returns to the oil cooling sump or jacket *U*, Fig. 20, around the carburetor outlets through the pipe *V*, and from the oil sump at the bottom of the crankcase through the channel *W*. The oil is drawn up from the sump *U* by the scavenging pump *X*, Fig. 21, and from the rear section of the crankcase by the

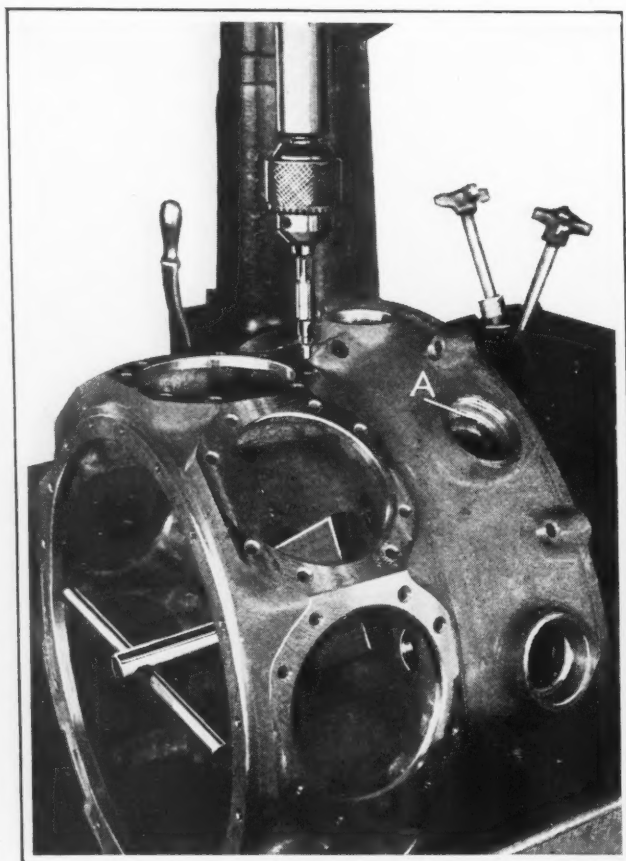


Fig. 27. Indexing Drill Jig for Main Crankcase Section

scavenging pump to the right of pump *X*, and returned to the tank.

A cross-sectional view through the oil filter and relief valve is shown in the lower right-hand corner of Fig. 21 at *F* and *E*, respectively. An outlet temperature gage on the instrument board connected with the oil cooling sump enables the operator to keep a check on the oil temperature at the point where it leaves the engine and is pumped back to the external tank. If the temperature rises above the allowable limit of 180 degrees F., a landing is made as soon as possible and the cause determined. Provision is also made for the use of a thermometer in the oil strainer for measuring the temperature of the oil entering the engine.

Special Work-holding Frame

In Fig. 26 is shown a fixture for holding cylinders while performing such operations as cutting the valve seats. The frame to which the three cylinders are bolted can be indexed by means of the

plug shown at the end of the fixture, so that the cylinders can be held in either a vertical or a horizontal position, as best suits the convenience of the workman. This fixture is typical of the many special labor-saving devices employed during the assembling and hand-fitting operations on the engine.

Indexing Drill Jig

A large number of drilling, reaming, counter-boring, spot-facing and tapping operations are required to complete the crankcase. Some of these operations are performed with the work held on the indexing fixture shown in Fig. 27. In addition to the indexing feature, which enables such opera-



Fig. 28. Machining Packing Nuts on an Automatic

tions as drilling and reaming to be done on different faces without unclamping the work, bushing plates and locating gage-blocks are employed to secure interchangeability of the parts that match the drilled holes.

* * *

CHROMIUM PLATING PATENTS

Patent rights for chromium plating owned by the General Chromium Corporation, the Union Carbide & Carbon Corporation, and the Vacuum Can Co. have been consolidated, and will be controlled by one corporation known as the General Chromium Corporation, which will have a factory and electro-chemical laboratories in Detroit, an affiliated plant in Chicago, and laboratories in Chicago and Niagara Falls. This company will do chromium plating and will also license and furnish engineering service for the chromium-plating process to manufacturers who wish to operate their own plating plants.

Notes and Comment on Engineering Topics

The total amount of platinum produced in the United States in 1926 amounted to 84,981 Troy ounces. The total consumption of platinum was 171,600 Troy ounces, of which 57 per cent was used in the manufacture of jewelry, 6 per cent in the chemical industries, and 13 per cent in the electrical industries.

An interesting development in car building has been inaugurated by the Cleveland street railways, where a trolley car built chiefly of "Duralumin" has been constructed. The standard design for steel cars was followed, "Duralumin" being substituted for steel with practically no changes in the thickness of the sheets, except that the thickness was increased for the body side sheets, the truck side frames, and the body bolsters. The side sill angles and a few other minor parts are of steel. The car weighs 30,300 pounds, as compared with 43,200 pounds for a steel car.

A condenser nearly 24 feet high and weighing 600,000 pounds, having 62,500 square feet of condensing surface, has been built at the South Philadelphia Works of the Westinghouse Electric & Mfg. Co. The large casting of the inlet water chamber weighs 36,000 pounds and will be bolted to a main condenser. The condenser is fitted with a total of 10,840 single tube sections, 1 inch in diameter and 22 feet 3 inches, each, in length. The total length of these copper tubes is approximately 46 miles, and when in operation with both of its circulating pumps, each passing 36,250 gallons per minute, the condenser will handle 104,500,000 gallons of water per day.

With nearly 20,000,000 automobiles in use throughout the country, there is a great need for efficient maintenance work and a great demand for time-saving tools and methods for handling automobile repair work. The manufacture of production machinery and tools has been highly developed, but the same systematic experience and careful thought has not yet been given to the equipment most efficient for automobile service stations, although recently tools of high quality and serviceability have been introduced. The manufacturer of service equipment can effectively cooperate with the larger automobile companies who are constantly recommending equipment for the use of their authorized service stations.

High-powered airplane propeller blades made from "Micarta," a material produced from ordinary canvas compressed into a non-corrosive product of metallic strength, which greatly enhances the degree of safety in operation, will be used by the Navy Department on its training planes. "Micarta" is likewise used for the manufacture of pulleys and fairleads in the construction

of airplanes, and because of its water-resisting and moisture-proof nature, parts manufactured of this material have been accepted as standard equipment both by the United States Army and Navy. The "Micarta" propeller is light in weight, smooth in action, and free from corrosion or warping in storage or service. The propeller, when bronze- or brass-tipped, has been found especially adaptable for seaplane use, because of its capacity to resist water spray.

The idea that the prosperity of one nation depends upon a curtailment of the business done by other nations is gradually being relegated to the same status as the idea that a nation can profit by war if it is the victor. Business men now are beginning to realize that the prosperity of one nation is very closely tied up with the prosperity of all nations, and that the United States will prosper and its foreign trade develop in proportion to the prosperity and the foreign trade of other nations. As an example of the manner in which all foreign trade is tied together, the director of the Bureau of Foreign and Domestic Commerce calls attention to the fact that the European demand for meat, wool, and grain from Argentina has greatly increased our export business to that country. As a direct result of the big trade of Argentina with Europe in agricultural products, that country has been enabled to purchase \$30,000,000 worth of automobiles from the United States. International trade cannot be confined to any one nation. As it develops, all nations benefit.

In a paper presented at the spring meeting of the American Society of Mechanical Engineers at White Sulphur Springs, W. Va., L. W. Wallace, secretary of the American Engineering Council, told of some of the findings of the council as a result of a nation-wide study of accidents and production. The study was comprehensive in range and contained an analysis of the accident and production performance of plants in twenty basic industries covering 120 products. The extent of the data obtained and analyzed represents the experience of about 14,000 companies employing two and one-half million workers. Some of the findings are: A steadily increasing rate of production over a period of years was accompanied by a reduction in the accident frequency and severity rates; the rate of production per unit of time worked has increased steadily and markedly during recent years; where organized safety work has been conducted, remarkable reductions have been made in both the accident frequency and severity rates; a relatively small percentage of industrial plants are equipped to carry on well-organized safety work; increases in productivity are more manifest and uniform than are decreases in accidents; an appalling loss of productive time may be directly attributed to industrial accidents.

Providing for Expansion in Manufacturing

Description of an Initial Installation in which the Need for Future Expansion was Considered

By HOWARD ROWLAND

WHEN planning to purchase machines for manufacturing a line of parts, the sagacious plant engineer will consider carefully both present and future needs. Present requirements may be small, but if the business is likely to grow rapidly, it is wise to plan for such a contingency. This article describes how the plant engineers of one concern so planned the installation of machines for milling hoist housings that the equipment could be readily employed at any time in a larger manufacturing program.

Standard Machines and Simple Fixtures are Employed

Standard milling machines were selected and provided with standard attachments and simple fixtures. This kept the installation cost at a minimum, and at the same time gave sufficient production. The first operation to be described is performed on the machine illustrated in Fig. 1, which is equipped with a vertical-spindle attachment. The operation consists of profiling top flange A, Fig. 4, of the housing. A shell end-mill is inserted in the vertical spindle, and the work moved past the cutter by the use of the table and cross-feeds.

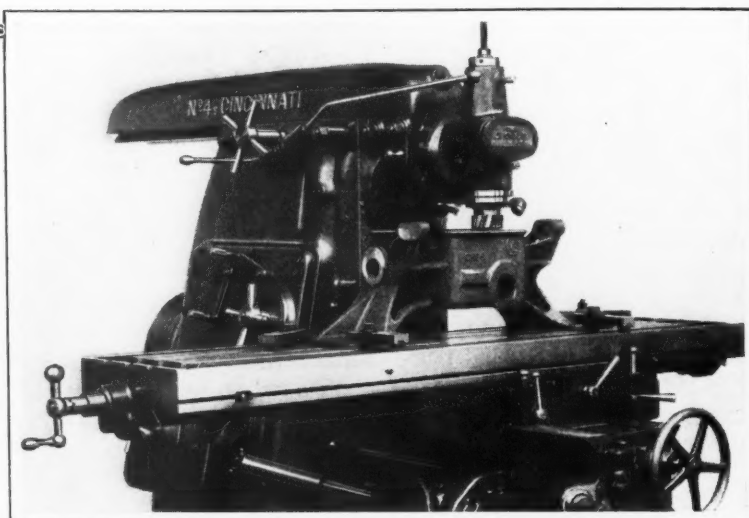


Fig. 1. Machining a Hoist Housing on a Standard Milling Machine Equipped with a Special Vertical-spindle Attachment

The cutter makes 104 revolutions per minute, and for the roughing cut, the work is fed at $4 \frac{3}{4}$ inches per minute, except at the corners, where a feed of $3 \frac{5}{8}$ inches is used because of excessive stock. A feed of 20 inches per minute is employed for the finishing operation.

In these operations, $\frac{3}{8}$ inch of stock is removed

from the flange. The housing is a steel casting. The previously finished feet of the casting are set directly on the machine table, and the casting is located by means of a tongue strip inserted in a T-slot in the table. Four strap clamps are tightened on the feet to hold the housing in position. The total time per piece is 16.6 minutes, including the roughing, finishing, and handling time. With an allowance of 20 per cent to cover delays ordinarily encountered in the shop, the production is 3 pieces per hour.

An Indexing Fixture Increases Production

Bosses B and C, Fig. 4, on each end of the hoist housing are milled on the machine illustrated in Fig. 2. From $\frac{1}{4}$ to $\frac{3}{8}$ inch of stock is removed by an inserted-blade face mill, mounted on the nose of a special extension spindle. The cutter is $7 \frac{1}{2}$

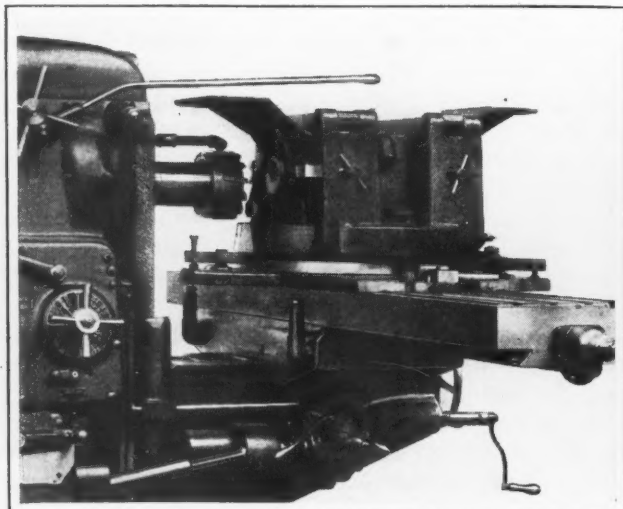


Fig. 2. An Indexing Fixture which Facilitates Milling Both Ends of the Housing

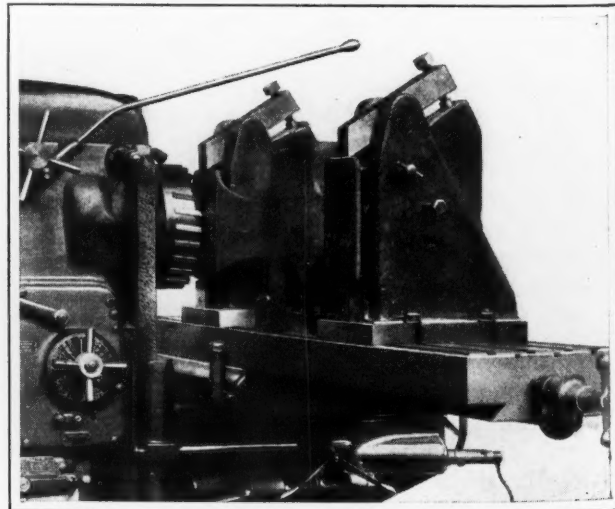


Fig. 3. An Operation Involving the Use of Three Simple Work-holding Fixtures

inches in diameter, which enables the two bosses at one end to be machined at each traverse of the work. For the roughing operation, the cutter is run at 28 revolutions per minute, and for the finishing operation, at 35 revolutions per minute. The feed of the work during the roughing cut is about 3 inches per minute, and during the finishing cut, 12 1/2 inches per minute.

The casting is held in a special 180-degree indexing fixture. The work rests on the finished top flange and is located by means of three fixed stops. Adjustable stops are used to hold the piece against the locating stops. Two large hinged clamps force down the top to hold the piece against the finished face. The special extension spindle is required on account of the fact that the bottom feet of the work project a considerable distance beyond the bosses being milled. Without this special spindle, the feet of the casting would strike the machine column before the cutter could contact with the bosses.

The cycle of each operation consists of milling the bosses on one end of the piece, rapidly returning the table, indexing the work 180 degrees, and milling the bosses on the other end. For indexing the work, the hinged clamps are loosened, and the top unit of the fixture, together with the work, is pulled around until an index-plunger engages a slot. After the top unit has been reclamped, the second milling step is performed. The total floor-to-floor time per piece is 14.73 minutes, including one roughing and one finishing cut on the bosses at each end. With a 20 per cent allowance for delays, a production of 3.4 housings per hour is obtained. A large supply of cutter lubricant is used in the operation.

Three Fixtures are Used to Hold the Part

The operation of milling surfaces *D*, Fig. 4, of the feet, is performed on the machine illustrated in Fig. 3. A 14-inch diameter inserted-blade face mill having twenty-four teeth machines each foot the entire length at one pass of the work. This cutter is revolved 18 times per minute and removes 5/16 inch of stock, the work being fed at the rate of 6 1/8 inches per minute.

Three fixtures mounted on the machine table hold the housing with the feet vertical and in line with the table. The work is seated on three fixed supports, two of which are beneath the feet and one beneath the center of the housing. The housing is lined up by means of two fixed side stops and one fixed end stop. A hand clamp at the front of the central fixture is operated to hold the work against these locating stops. Spring-plunger stops are also used behind the top edge of the feet, and two large pinch clamps are applied to these edges to hold the work securely.

After one foot has been milled, the table is rapidly advanced to bring the other foot to the cutter. The floor-to-floor time for milling both feet, employing a fast loading arrangement, is 7.5 minutes. With a 20 per cent allowance for delays, this gives a production of approximately 7 pieces per hour. Cutter lubricant is also used copiously in this operation.

The Installation Permits Production Expansion

The pre-installation analysis of the present production requirements of this concern indicated that the equipment would take care of the work satisfactorily. When the recommendation was originally submitted to the management, a program was included which showed what equipment would be required if the production requirements were doubled or tripled. A detailed analysis had been made to determine just how many machine hours would be required for each operation and how the available

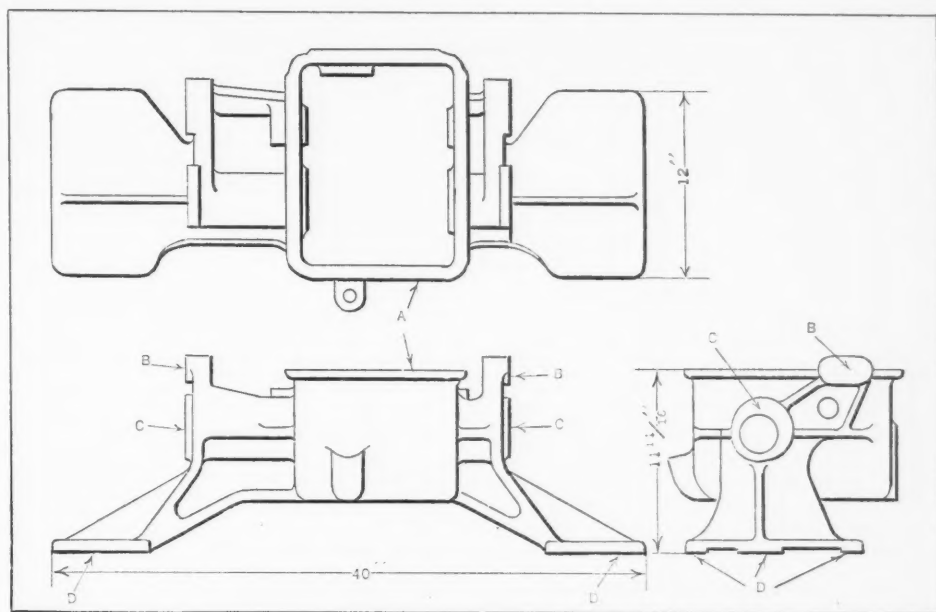


Fig. 4. Outline Drawing of the Hoist Housing Machined with the Equipment Shown in Figs. 1 to 3

machines could be worked into a larger program with the greatest possible efficiency. It was found that the total machine hours now available more than take care of present production requirements, and, in addition, the standard machines can readily be used for other work assigned to them.

* * *

RESUSCITATION FROM ELECTRIC SHOCK

In cases where unconsciousness has been caused by electric shock, gas poisoning, or drowning, the prone pressure method of resuscitation has proved one of the most effective means of effecting the restoration of breathing. Those interested in this subject may obtain a reprint of a paper on the "Prone Pressure Method of Resuscitation," read by S. W. Ashe of the Pittsfield Works of the General Electric Co., Pittsfield, Mass., before the New England Section of the National Electric Light Association, which gives complete instructions, with illustrations, relating to the application of the method, dealing particularly with accidents due to electric shock, but also with drowning and gas cases.

Training and Developing Foremen

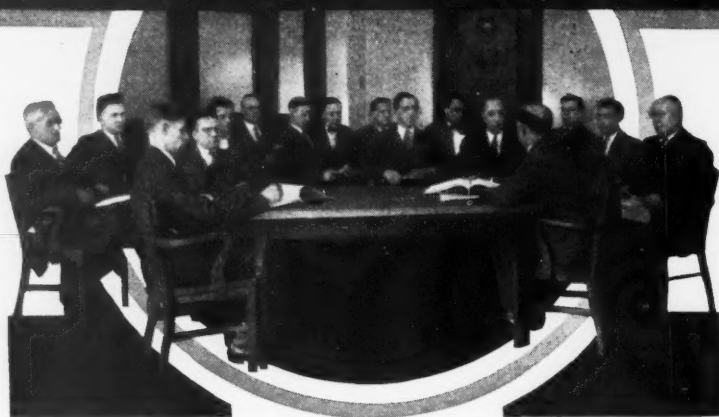
SEVEN years ago the Westinghouse Electric & Mfg. Co. adopted a plan for systematically training and developing foremen and other members of the supervisory forces. In adopting the plan to be described, more emphasis has been placed upon the idea of developing rather than training men. The word "developing" in this connection implies a great deal. In order to develop you must have

something to start with, something that can be developed. Furthermore, developing takes time and patience. As a parallel, the development of foremen and supervisors may be compared to developing a negative and printing a picture.

In order to obtain a satisfactory picture, we must have, first of all, proper exposure. A good negative cannot be obtained from a poor exposure—we must have something worth while to start with. Next, we require the right kind of chemicals and the right kind of manipulation to develop the negative. One man will take a negative and develop it with a certain kind of chemical and obtain rather unsatisfactory results; another man who is an expert at developing will take the same chemicals and get an excellent negative. After the negative is finished, the success of the picture depends to a great extent upon the proper printing and trimming. Too much or too little background may ruin an otherwise good picture. Hence, proper mounting and proper framing have a great deal to do with the production of a satisfactory picture.

With a little imagination, this simile may be applied to developing foremen. A great deal of the success in training a foreman or supervisor depends upon the man picked from the start; upon the opportunities for development that are provided for him; upon the environment to which he is exposed; upon where he is placed and what use is

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Methods Used by the Westinghouse Electric & Mfg. Co., in Maintaining a Supervisory Force of High Quality

By W. D. STEARNS, Superintendent of Personnel,
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

problems have been studied.

3. Methods employed in carrying out the policies adopted.

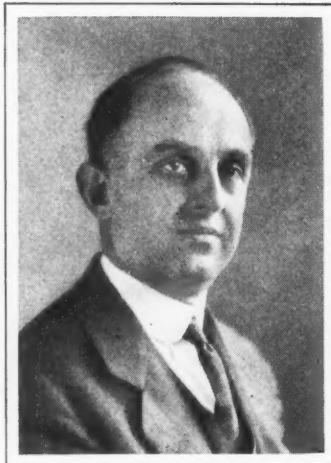
4. The results obtained by training and developing foremen and supervisors.

The Preliminary Study Necessary for Adopting a Satisfactory Policy of Training

Much waste in manufacturing organizations is due to lack of proper understanding of the co-ordination of the various elements involved in a successful business enterprise. Using simple and everyday terms, the writer has selected eight factors as the most important in the success of a manufacturing enterprise, and has termed these factors the eight manufacturing M's—markets, money, mills, machinery, materials, methods, management, and men.

The last mentioned is, in the author's opinion, the most important, although, unfortunately, in many enterprises this fact is not properly recognized. Many firms spend thousands of dollars for the installation of machinery in order to increase the efficiency of a department 5 or 10 per cent; then men are put to work operating these machines without training or proper supervision, so that the machines are operated only at 50 per cent of their efficiency.

The biggest waste in most manufacturing establishments is the waste of the capacity of men. None of the first seven manufacturing M's can be put to their proper use unless the right kind of men, with adequate training and the right attitude, under competent supervision, are available; and it takes well trained supervisors to deter-



W. D. Stearns

mine whether the men working in the plant are the proper type for the work to be performed. Hence, the right kind of foreman and supervisor becomes the essential factor in manufacturing success.

Having decided, then, that the way to reduce waste and increase efficiency is by improved supervision, the next step is to study the supervisor. The term supervisor is used advisedly as being more comprehensive than the word foreman, because supervisor includes the entire supervising force rather than the heads of manufacturing departments only. There are two kinds of supervisors, which can best be classified as supervisors of the old school and supervisors of the new school. There are men with excellent mechanical ability, but not a great deal of executive and mental ability; and there are men with excellent executive and mental ability, but not much mechanical training. The problem presented to the management of an industrial enterprise is to afford each of these kinds of men an opportunity to obtain the thing that they lack.

The strong point of the supervisor of the old school is that he knows the technique of his job—the machines, methods, and operations. He is a good daily routine worker in his special field. His weak points are that he lacks broad vision and an appreciation of the underlying reasons for the performance of work in a certain way. He lacks ability to analyze problems, and does not understand the relationship between the various functions or parts of the organization. He has little perspective and little appreciation or sense of relative values, and last, but perhaps the most important of his shortcomings, he does not understand men.

The Establishment of Definite Policies for Developing Foremen

In developing the latent abilities of the supervisory force, the guiding principle should be to get information out of the men rather than to attempt to "pump" it into them. In the Westinghouse organization, there are 700 supervisors, and it was felt from the start that if it were possible to get all these men together in a group, so that they could exchange ideas, the very best training course obtainable for the men would be available; because, considered as a unit, these men have a better vision of the problems of foremanship than any one, two, or even ten men could give them. The whole training program has, therefore, been based on the old saying, "If you have an idea and I have an idea and we swap, then each of us has two ideas when we are through."

The whole system of foreman development in this plant has, therefore, been built on the definite policy that it is better to get men to do things for themselves than for someone else to do something

for them. The entire development program is a voluntary proposition. It is not compulsory. Membership in the courses or the committees is voluntary. Having once decided that he wishes to undertake this self-development program, the man is made to feel that it is part of his regular job. All meetings are held on the company's time, and if a man has elected to take the course, he is made to feel that it is part of his job to be at the meetings.

In deciding upon the policy governing the development and training work, it was recognized that the supervisor's greatest lack is that of vision. He is likely to have too narrow a viewpoint. The meetings or courses, therefore, take up the discussion of broadening subjects that are outside of the daily routine of the foremen and supervisors. An effort is made to get the men to think and reason. One of the superintendents in the plant, when asked

what he considered to be the greatest problem in handling men said, "To get them to think." The training plan is intended to develop the thinking faculty and the imagination.

The Methods Employed in Carrying Out the Policies Decided Upon

The way the policies outlined in the preceding paragraphs were carried out may be briefly outlined as follows: About seven years ago the works manager of the plant called together a group of twenty representative supervisors and explained to them that they had been chosen to work out some plan for developing the whole group of supervisors and foremen in the plant. After a thorough explanation had been made of the object in

view, the matter was left entirely to this group. They at once organized a committee, meeting an hour once a week during working hours. The questions discussed by this general committee during the first year were mainly:

1. What are the purposes of the supervisors' meetings that are being held?
2. How can these purposes be best accomplished?
3. To make these meetings most effective, what are we to discuss and what should be the scope of these discussions?

At successive meetings each man in the group of twenty took his turn as chairman and leader of the discussion. The committee prepared an outline to be followed in the meetings that would later include the entire supervisory force of the plant. In this way, each one of the twenty men on the "general committee," who were later each in his place to conduct "sub-committee" meetings, obtained a common understanding of the subject matter and the methods and procedure. A report of the consensus of opinion of the entire group was given to each member to be used as a guide when he acted as the chairman of a sub-committee.

The training and development program affecting the entire supervisory force was put into effect as follows: The plan was presented to the entire body of 700 supervisors in a talk by a member of the general committee. Immediately between 200 and 300 applications were received, and from these 120 men were selected by the general committee to make up the first ten sub-committees.

In forming these groups of men, the main thing borne in mind was the balancing of the sub-committee as regards occupation, amount of previous experience, age, ability, general viewpoint, and departmental distribution of the members. Among the groups or committees was, for example, one for each of the following main sub-divisions: General foremen, assistant general foremen, foremen, assistant foremen, departmental production supervisors, departmental accountants, rate foremen, inspectors, tool supervisors, and time study men.

As mentioned, each of the ten groups or sub-committees has for its chairman a member of the general committee, and this chairman appoints a secretary from the sub-committee. Each of the ten secretaries submits a report of every weekly meeting to the chairman of the general committee, and these reports are merged and edited in the form of a pamphlet which is issued each year to all the supervisors.

The subjects of these pamphlets for the last five years have been: Characteristics of a Good Supervisor; Duties and Responsibilities of a Foreman, Production Man, Cost Man, Rate Man, and Inspector; the New Employee; Measuring and Grading Employees; Wages; Following an Order through the Shop; Waste in Industry; Building up and Maintaining a Working Force; Safety; Control of Work in Process of Manufacture; Transportation and Handling of Materials; Quality Production; Control of Defective Work and Material Charges; Service Department; Suggestion Systems; and Factory Costs.

The Purposes to be Attained

The purposes to be attained by such meetings as outlined have been defined by the general committee as follows:

1. To develop the habit of original and constructive thinking.
2. To convey to the supervisors a correct understanding of the company's ideals and policies of management.
3. To afford the supervisor, as an individual, a better opportunity to express his views concerning these ideals and policies of management.
4. To emphasize the fact that fundamentally the interests of all Westinghouse employees are

identical; and to promote these interests through the medium of greater cooperation and more sympathetic understanding.

5. To show more clearly the close relationship and interdependence that exists between the job of each supervisor and the work of all other departments—to make clear the interdependence of sales, engineering, purchasing, storekeeping, employment, rate-setting, production, cost-keeping, inspection, testing, maintenance, and shipping.

6. To broaden the general knowledge of the supervisor in regard to industrial problems, the broadening effect being due mainly to his contact with other supervisors and executives at the meetings.

7. To give the supervisor a better perspective in regard to his responsibilities and opportunities.

8. To develop the personal qualities of the supervisor, particularly those necessary for leadership.

The Subjects Discussed at Foremen's Meetings

It would take too much space to list all the subjects that have been discussed at the various meetings of the supervisors and foremen during the last five years. It may be of interest, however, to mention a few of the subjects of the weekly discussions, and those of most general interest, therefore, are listed as follows: The Characteristics of a Good Supervisor; Selecting, Instructing and Training the New Employee; Economic Use of Materials; Measuring and Rating Men; Economic Use of Equipment; Lay-out and Arrangement of Equipment; Building up and Reducing a Working Force to Conform with Fluctuations of Business; Arousing Interest and

Enthusiasm in Men; Teamwork; Securing and Using Suggestions; Interpreting the Management to the Workman and the Workman to the Management; How to Deal with Discontented Workmen; When and How to Discharge Men; Wage Payment Systems; Planning, Scheduling, and Routing Work; and Efficient Handling of Materials.

In addition, throughout the course there is a demand for information on certain subjects which can be better handled by a lecture by a qualified man, and the following list contains subjects suggested for such lectures: Company Ideals and Policies; History, Organization and Place of the Company in Industry; the Company's Products and What They Stand for in the Community; Industrial Economics and Costs of Manufacturing; Labor Turnover; Labor Unions; the Work of the Sales Department and of the Engineering Department; and Factory Overhead. Other subjects will readily suggest themselves.

How to Prevent Stagnation in the Training Work

At the end of the first year of this training and development program, it was decided that new men should be placed on the general committee annually. At the end of the second year, due to resignations and changes, the general committee was decreased to fifteen. From then on, at the end of each year, five men have resigned and five new men have been appointed, so that every third year there is a complete change in the personnel of the general committee.

It should be noted that no attempt is made to cover a set course or certain specified subjects. In fact, this is definitely avoided. For six years the complete program has been under way and the same ground has not been covered twice by any committee. Each year, every one of the 700 supervisors is invited to send in his application to take part in this work, if interested. Each year there are from 250 to 300 applications, and from these 120 are selected as members of the committees. If a man does not attend the meetings, he is told that he had better resign, because there are 200 other men waiting for the opportunity that he does not seem to appreciate. As a matter of fact, the men attend with remarkable regularity, and only an emergency job will prevent a foreman from attending meetings.

Training Men to Become Foremen

So far this article has dealt with the methods used for developing the latent qualities of men who already are foremen or hold other supervisory positions. However, another course is maintained for training and developing men that are to become foremen. Ten men are admitted twice a year to this course, which is of one year's duration. The subjects covered are time study, scheduling and planning, storekeeping, shipping, costs, employment methods, and production problems—briefly, subjects with which the foreman does not come into contact during his regular department work, but which it is important for him to know and understand in order to manage his department efficiently. Furthermore, the superintendent of personnel meets with these men an hour twice a week on the company's time to discuss subjects similar to those discussed at the sub-committee meetings of the supervisors.

The men chosen for this training course are generally men taken from the floor, employed at hourly rates. No man is appointed as assistant foreman until he has had some kind of training. The men taking this course do nothing else during their year of training then concentrate upon the training work. The men selected are about twenty-eight years old and generally have an education equivalent to that of high school. It is generally possible to place these men in positions of assistant foremen shortly after the completion of the training course, provided they possess the qualifications required in a supervisor.

What Results Have Been Obtained by Developing Foremen

In a large industry, it is difficult to measure the specific results obtained by any one factor enter-

ing into the intricate fabric of manufacturing, as it is impossible to keep the effects from various progressive elements separate. For example, while labor turnover has decreased, this cannot be attributed solely to the system of training foremen, because many other things have been done as well that tend to reduce labor turnover.

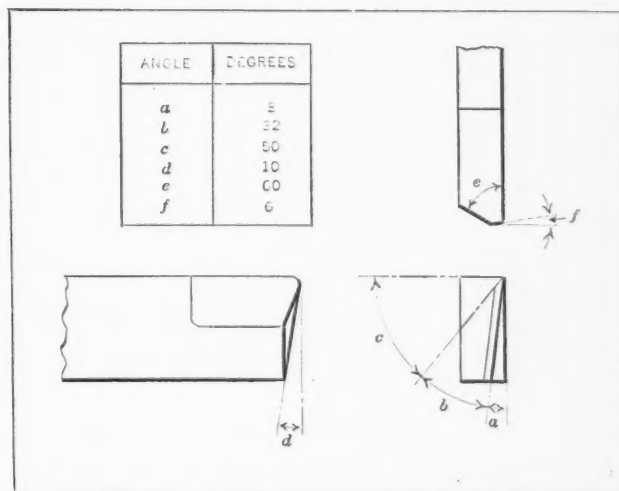
There is one specific point, however, that should be emphasized in regard to the effect of this training program. The meetings have developed the personality of the supervisory force and have created an enthusiasm otherwise difficult to stimulate. The men themselves believe in the plan for self-development offered to them by the system outlined. There are two evidences of this—first, there are more than twice as many applications for membership on the committee as are available each year, and second, the men concerned want more rather than less of this work. For several years, the plan has been not to start the meetings until October and to stop them in the latter part of May. Pressure was brought to bear by the foremen themselves to start in September, and each year they have tried to carry the work through the month of June. Hence, there is no question but that the men most concerned like the plan and want it, and the management is convinced that the morale has been improved, and a spirit of co-operation has been developed between the company and its supervisory force that did not exist previous to the inauguration of this plan.

* * *

TOOL FOR CUTTING ALUMINUM ALLOYS

In an article on machining high-silicon aluminum alloys, published in *Zeitschrift fuer Metallkunde*, a tool is shown which is said to give very good results as a metal removing and finishing tool. The illustration shows the various rake angles.

In planing an alloy of 78 per cent aluminum and 22 per cent silicon, this tool gave a mirror finish at 125 strokes per minute, the length of stroke being $2 \frac{3}{8}$ inches, the feed $1 \frac{3}{16}$ inches per minute, and the depth of cut, $\frac{1}{4}$ inch. Equally good results were obtained with the tool in a lathe, which, at $\frac{5}{8}$ -inch feed per minute, took a cut $\frac{1}{4}$ inch deep at 240 revolutions per minute on a diameter of 2 inches.



Cutting Tool for Aluminum Alloys

WELDED STEEL FRAMES FOR SPECIAL MACHINERY

By R. E. KINKEAD, Chief Engineer, Welder Division,
The Lincoln Electric Co., Cleveland, Ohio

In making complicated parts for special machinery, welded steel construction may prove better for the purpose and more economical than gray iron castings. The special textile machine frames or tables shown in Figs. 1 and 2 are typical of the work done in this field of welded steel construction. It is difficult to so design special machinery parts that they will do the work required without alteration. Castings that fail in service on special machines cause expensive delays and are costly to replace. At the same cost, "Stable-Arc" welded steel pieces may be used in many cases in place of castings, with a great increase in strength and rigidity.

Steel parts will not break; the most that is likely to happen is deformation of the pieces. A steel part thus affected may be returned to service by

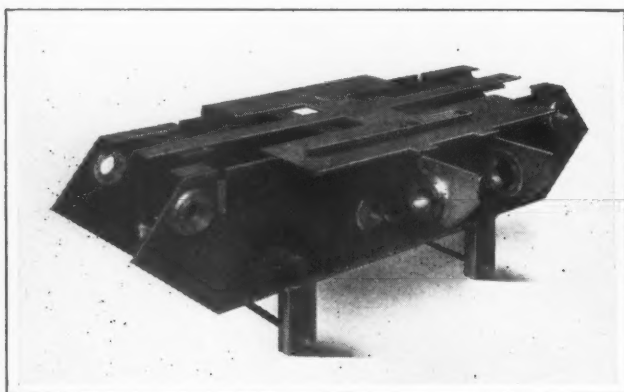


Fig. 1. Welded Steel Framework of Special Textile Machine

correcting the distortion. Additional strength may be added at negligible cost at any point. On the other hand, failure of a casting means at least a new casting, and, in case of defective design, a new pattern. From the user's point of view, a special machine made of welded steel instead of castings has the important advantages named.

The utility of a special machine is to some extent dependent upon the cost of the machine. More special machinery would be used if the cost were reduced. Such products as flashlight batteries, tooth paste, automobile parts, etc., are handled during production, by special machinery. The relatively low cost and enormous volume of sales are to some extent due to these special high-production machines.

By reducing the cost of special machinery, many products may be made at lower costs and find wider distribution. Patterns are an essential element of cost in special machinery. Welded steel construction eliminates pattern expense and substitutes a method in which work is done directly from the drawings. Usually the welded steel piece costs less than the casting alone, not considering the pattern cost.

The framework of a special textile machine constructed from designs by the Luehrs Co., Cleveland, Ohio, assisted by the Lincoln Electric Co., is shown in Figs. 1 and 2. Welded steel construction, besides being applicable to special machinery, may

also be applied to special modifications of standard machines built in production quantities. There are many cases in which a slight modification of a standard machine to meet special conditions will enable the manufacturer to get orders which he would otherwise lose.

By the use of welded steel construction, special features may in some cases be taken care of at a reasonable cost. This is particularly true in machine base construction where a special base may be required. To make the drawings and get the pattern made for the special base, might involve prohibitive costs. On the other hand, the use of welded steel construction would eliminate the pattern cost and, in many cases, permit the base to be built at less cost than the casting.

This leads to the conclusion that the whole machine ought to be of welded steel construction instead of castings. This conclusion is correct so long as the substitution of welded steel is the means of reducing costs. It is claimed that welded steel

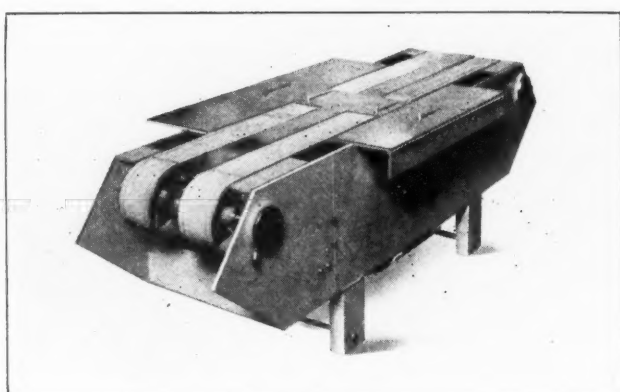


Fig. 2. Framework Shown in Fig. 1 with Parts Mounted on it

may be substituted for castings with very large economies in the case of large parts of simple shape.

* * *

ADVANTAGES OF HAND-TO-MOUTH BUYING

So much has been said about the difficulties resulting from hand-to-mouth buying that it is well worth while pointing out a number of the important advantages of this method of buying. Largely as a result of hand-to-mouth buying, abnormal fluctuations of employment have almost disappeared during the last two years. A few years ago, for example, it was not unusual for the Bethlehem Steel Co. to employ 30,000 men at one time of the year and 80,000 men at another time. In 1925 this fluctuation was limited to 7500, the employment figures varying from 59,000 to 66,500 at various seasons during the year.

It is also interesting to note that, in the United States as a whole, from 1921 to 1925, the volume of manufactured goods increased 62 per cent, while employment increased not quite 15 per cent. In the automobile field, the output per worker was three times as great in 1925 as in 1921. In the same period, the iron and steel industry increased its production about 50 per cent per man employed. The steadier employment is, other factors remaining the same, the greater the output that may be expected per man employed.

Lettering Roll for Automatic Screw Machine

By HENRY SIMON

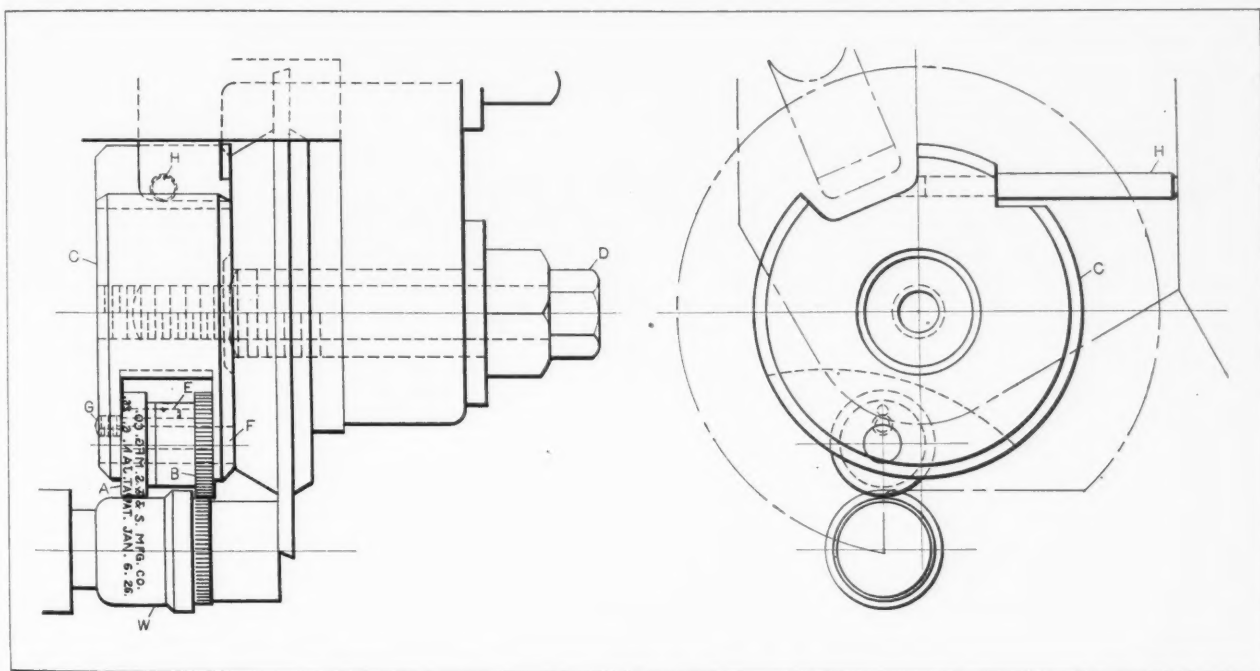
THE marking of the maker's name, patent dates, etc., on cylindrical pieces is sometimes done on automatic screw machines by a single pass of a quadrant upon which the lettering is engraved. This method, while very rapid, is generally employed only where a very light impression is required. A method of producing deeper lettering, which has given satisfactory results when applied to steel, is described in the following paragraphs.

Lettering consisting of about thirty characters was to be rolled on the formed end of the part shown at *W* in the accompanying illustration. The finished part also had to be drilled, bored, and

As soon as the lettering is done, the form tool, which had been withdrawn to allow the chips to escape, advances again and dwells for about ten revolutions. This removes the rolled-up burr from the lettering and leaves a highly polished surface on the product, with the name neatly engraved.

By the use of the knurl roll-holder shown, all complications that might otherwise result from the introduction of the rolling operation, in the way of crowding the set-up, were avoided, and it was possible to use a regular cut-off tool on the front cross-slide.

The holder consists of a thick disk C , independently attached to the back face of the cut-off



Lettering Roll Attachment for Screw Machine

knurled on the narrow collar, and the finish was required to be good all over. Because of its relatively short length, the part was made by the "cut off and form" process, the form tool being withdrawn a moment before the lettering operation shown in the illustration is begun.

The lettering is done by means of a roll *A*, connected with a timer-roll *B* which synchronizes the rotation of the product with that of the lettering roll *A*. The timer-roll is made in the form of a narrow straight knuri of medium fine pitch. The outside diameter of the timer-roll is slightly larger than the extreme diameter of the lettering roll, and it engages a corresponding collar specially formed on the front part of the product *W* which is turned off in a later operation. In other words, the timer-roll may be considered to be a gear that generates its duplicate upon the product, thereby compelling the lettering roll and product to turn exactly in unison.

tool by a screw *D* passing through the hollow stem of the special pivot screw used for the cut-off tool. In front, the holder body is slotted to receive the lettering and timer rolls *A* and *B*, which are held together by a pin *E* and which run on a hardened shaft *F*, held in place by a screw *G*. The holder is held at the proper height adjustment for the rolls by means of a pin *H* which is set into the holder at the opposite side, and is perpendicular to and rests upon the face of the cross-slide, the rotation of the spindle tending to keep the holder firmly in contact with this pin.

Just above the seat of the pin in the holder, the periphery is notched to give room for the hook of the cut-off tool clamp screw. By this arrangement, the cut-off tool can be adjusted practically as easily as usual, while the lettering roll holder is so positively located as not to require any adjustment, and automatically assumes its true position as soon as screw *D* is tightened.

Satisfactory timer-rolls were produced by rolling tool-steel blanks against a regular straight knurl on a lathe. When the exact blank diameter of these rolls was once found, they were quickly produced and lasted well. A knurl of 3/4 inch over-all diameter, having a depth of tooth of 0.0175 inch and a pitch of 0.035 inch, was used for this purpose. The finished over-all diameter of the timer-roll was required to be about 0.740 inch. The diameter of the lettering roll was made about 0.015 inch smaller than the over-all diameter of the timer-roll, or 0.725 inch, in order to insure having the teeth of the timer-roll enter well into the work before the letters even touched it.

The blank diameter and the diameter of the temporary timing collar of the work was 0.727 inch. It should be mentioned, however, that it is difficult and, in fact, almost impossible, to calculate the exact diameters by means of formulas, and while the diameters given present a fair idea of the basis on which the parts were made, the dimensions were changed slightly after repeated trials had been made. This was easily accomplished by making slight changes in the setting of the form tool, provision having been made on the product which allowed a tolerance of plus or minus 0.004 inch on the diameter of the lettered portion. It was also found that allowance had to be made for individual lettering rolls and occasionally, for wear on the lettering and timing rolls.

With the equipment described, from 2500 to 5000 perfect impressions were produced with each lettering roll before any of the letters became damaged.

* * *

PREVENTING EYE INJURIES IN THE SHOP

By A. EYLES

The editorial "Eye Accidents in the Industries" in March MACHINERY, page 498, is worthy of study by all machine shop superintendents and workmen. Experience as a shop foreman in a large engineering establishment during the last twenty-four years leads me to give some of my views on eye hazards in the industry. Each man can help prevent or minimize these accidents by exercising care and judgment in performing his work.

United effort can do much to decrease the present rate of eye accidents in industrial occupations. The matter is of vital importance to the employer, as well as to the workman, since eye accidents seriously affect production. Many of the larger firms in the machine building field provide goggles for their workers, but it is amazing how employees continue to risk their eyesight by neglecting to use these protective devices. Industrial executives, superintendents, and foremen should cooperate in enforcing definite rules which will compel workmen to wear eye protectors on all jobs that present eye injury hazards.

Many workmen lose their eyesight by permitting fellow workmen to remove foreign substances from their eyes. In many factories employees may be seen using old matches, toothpicks, soiled pocket handkerchiefs, etc., for removing particles from the eyes of their fellow workers. In some cases the particle actually penetrates the coat of the eyeball, and unless it is properly removed, especially

if it is a particle of metal, the sight of both eyes is in danger through sympathetic inflammation, which may cause blindness.

Efficient eye protectors should be worn by workmen when grinding, buffing, handling molten metal, babbitting, chipping, riveting, drilling, welding, handling acids or dangerous chemicals, and all other operations that endanger the eyes. Forging machines and drop-hammers also add to the hazards. Hot saws send large showers of sparks in all directions, which may cause serious injury to the eyes. Many workmen have lost the sight of an eye by being struck with a bit of steel broken from the head of a cold chisel, set punch, or other tool.

Unfortunately, many workmen are ignorant of the consequences likely to result from failure to wear safety goggles when performing operations that expose the eyes to danger. The process of educating and training the workers to wear goggles should be vigorously promoted. Workmen frequently argue that safety goggles hinder production. This may be true in the case of improperly designed goggles. Clear vision is an essential feature of an efficient eye protector.

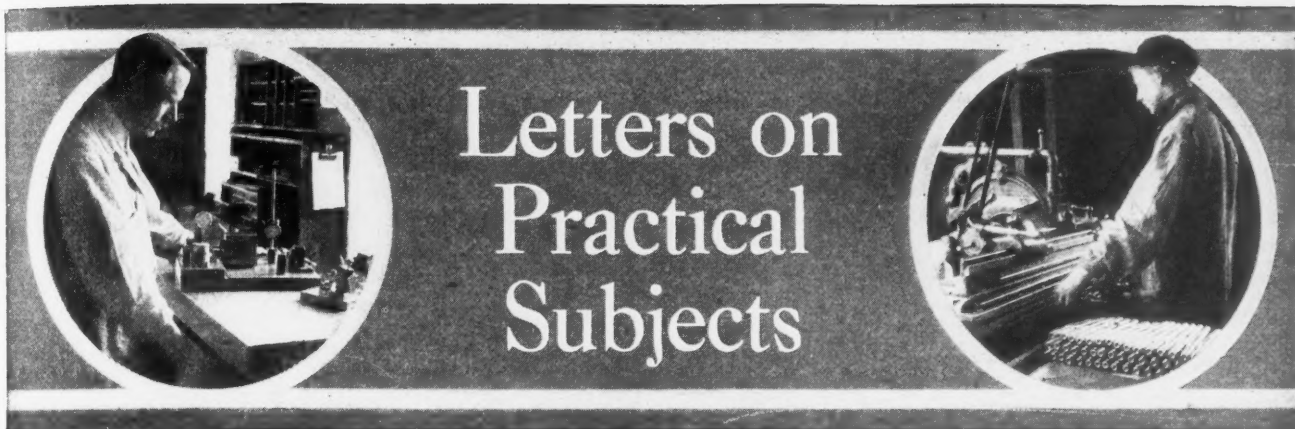
With proper eye protection, production will actually be increased on many jobs, since the workman can work faster when he does not have to be constantly guarding his eyes against chips, dust, or flying scale. As a case in point, some time ago the writer assisted in the construction of a large number of all-metal railway passenger cars. The panels and roof plates consisted entirely of aluminum sheets riveted to angle, and channel aluminum alloy and steel sections. Much overhead drilling with electric and pneumatic drills was necessary in this work, involving serious eye-injury hazard from flying chips. At first many of the workers received eye injuries, and on several occasions medical attention was necessary.

Eye protectors of poor design were used, but owing to the great number of eye injuries, it became necessary to obtain improved protectors having substantial screens designed to shield the eyes from all sides. This reduced the eye injuries from 7.75 per cent of the total number of men employed on the job to 0.75 per cent. These figures present an undeniable argument in favor of the general use of effective eye protectors. Production was also increased 50 per cent in the case of overhead drilling operations after supplying the improved protectors.

The goggles or eye protectors selected should be adapted for the particular work handled. They should be as light as possible and have suitable side protectors. The metal parts should be rust-proof and easily adjusted, by bending, to conform to the shape of the face. Let us keep in mind the fact that the proper use of suitable safety goggles has proved the most effective means of protecting the eyesight of workmen in large industrial plants.

* * *

During 1926, the United Kingdom imported from the United States machine tools to a value of \$455,000. The imports from Germany amounted to \$241,000, and from all other countries combined, \$765,000.



SPECIAL MILLING TOOL FOR TURRET LATHE

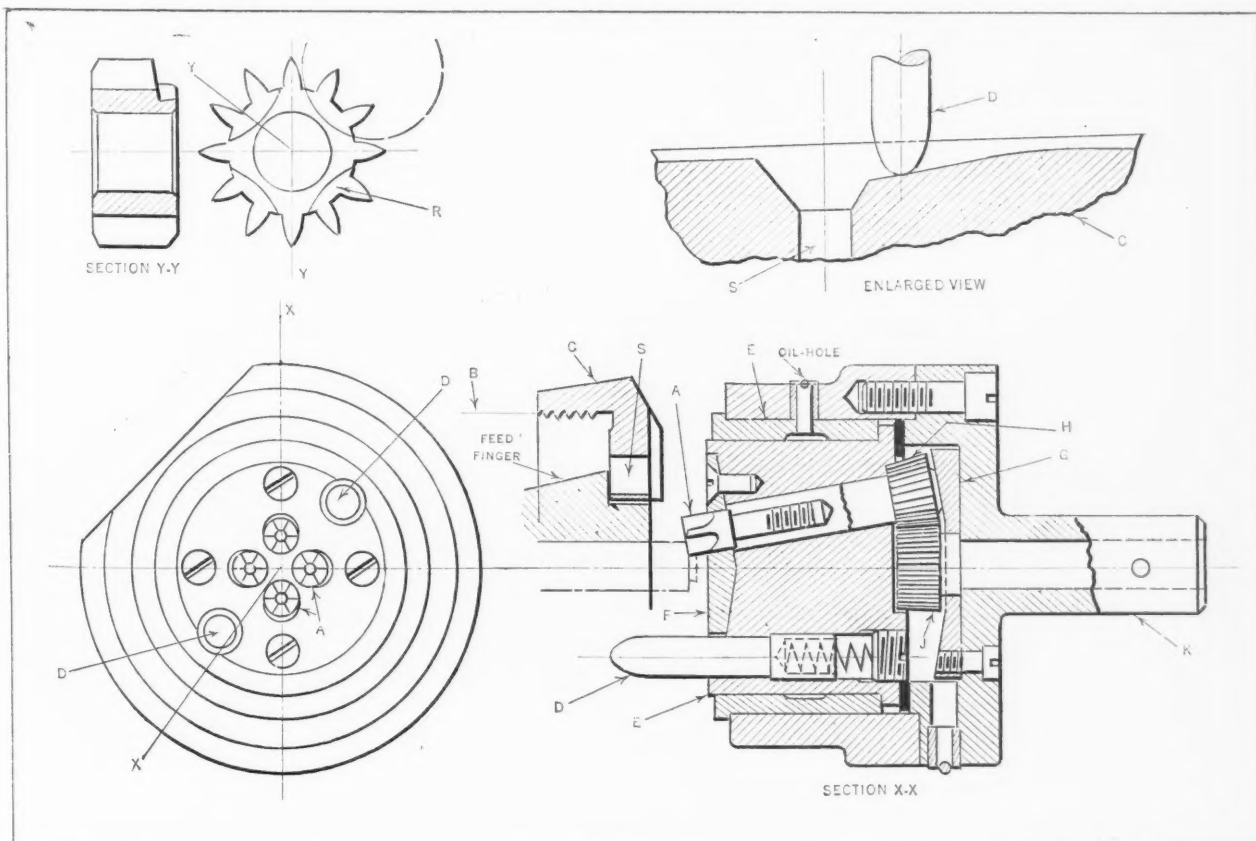
Rather an unusual turret lathe tool is shown in the accompanying illustration. This tool is used for milling four angular tooth clearances R in a small brass pinion, as shown in the view in the upper left-hand corner of the illustration. The pinions are used in an automatic counting device, and the four clearances are required to fit the outside curve of a hunting tooth gear. They were formerly machined in a milling fixture, which proved too slow. After some experimenting, the following method was adopted.

Brass pinion rod with the teeth already drawn to shape and size is used, being fed through a No. 0 Brown & Sharpe automatic machine. The feeding finger incorporated in the spindle of this machine and used in clamping the stock has a locating pin which fits a tooth space, so that the pinion rod is always located correctly with relation to the end-mills A . The hole in the pinion is first drilled, reamed, and countersunk by means of ordinary

turret tools, after which the tool shown in the illustration is tripped into place and brought forward.

The machine spindle B , traveling at 1800 revolutions per minute, has two holes S drilled in the spindle nose-piece C , which catches the two projecting spring pins D in the fixture. This causes the sleeve E to rotate at the same speed as the spindle. The four end-mills A are placed at the required angle, as shown, and are equally spaced in the sleeve E , being retained by the hardened plates F and G . The end-mills thus rotate with the sleeve. At the same time, the gears H at the end of the mills roll on the sun gear J . Gear J is securely pinned to the shank K of the tool. As this shank is clamped in the turret of the machine, the sun gear cannot turn, and therefore, the planetary gears H are caused to revolve.

It is evident that since both the pinion rod and the end-mill bearing sleeve E rotate at the same rate of speed, the effect is the same as though they were both stationary and only the end-mills re-



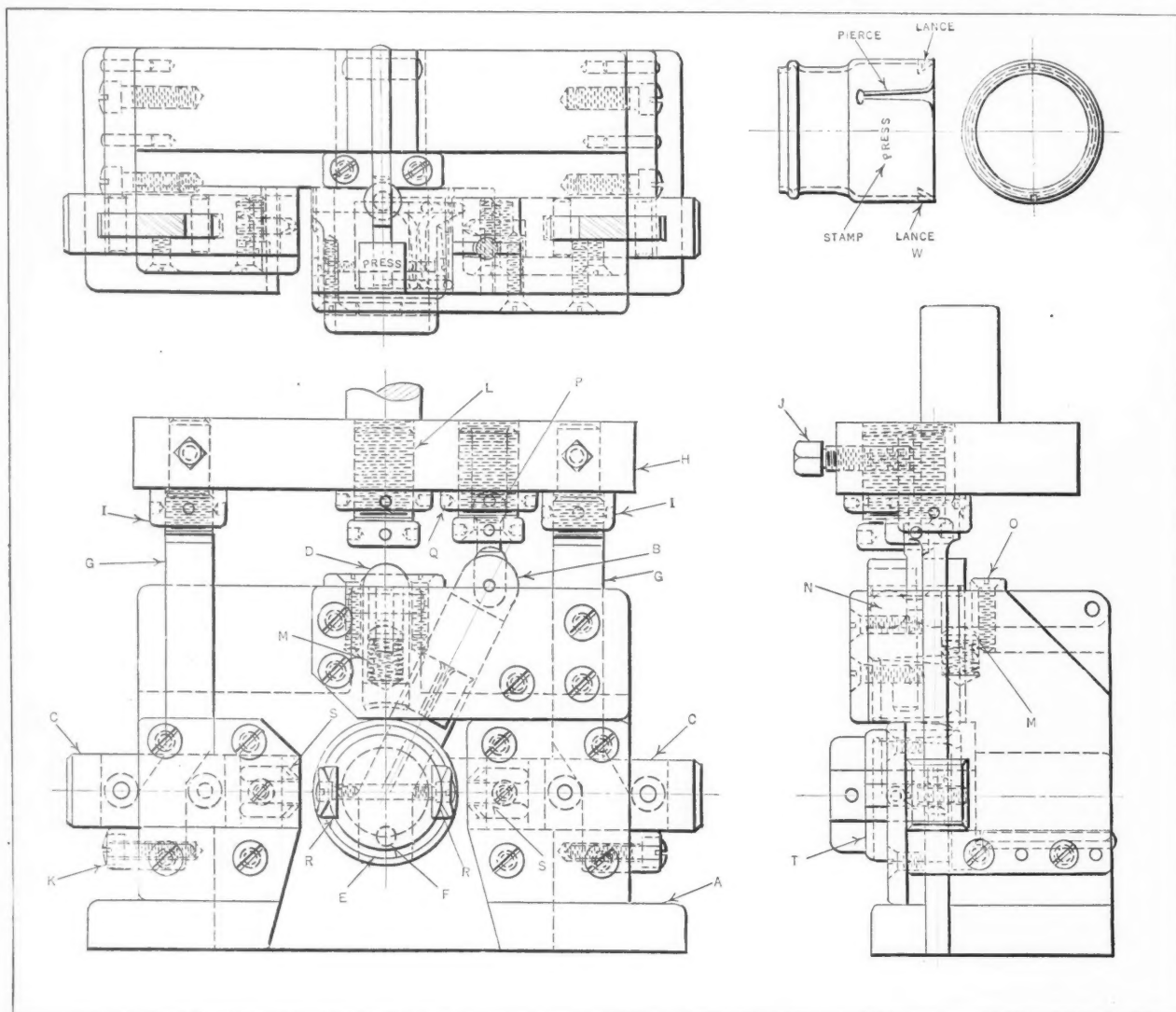
Special Multiple Cutter Milling Tool for Turret Lathe

volved and cut into the pinion at the proper points. A milling operation is thus accomplished in the automatic turret lathe, after which the pinion is cut off and burred, preparatory to assembling in the counting device.

It might be mentioned here that the nose-piece *C* is of hardened steel, and the holes are generously relieved at the mouths, as indicated in the enlarged view. The holes are countersunk from an inclined groove around the face of the nose-piece. Hence, the hardened projecting pins do not engage with a shock, as they are caught by this groove first, before being introduced into the holes, the springs behind the pins taking up any inequalities that

The anvil *E* is a drive fit in the die-block, and is positioned by the pin *F*. This pin prevents the anvil from turning in the die-block. The two slides *C* that carry the lancing tools receive a reciprocating motion from the two cams *G*, which act against the rollers pivoted in the slides *C*. The cams are a snug fit in the punch-block *H*, and can be adjusted to give the required throw by turning the spanner nuts *I* in the proper direction. After the required setting has been obtained, it is locked by tightening the set-screws *J*. The cross-pieces *K* take the back thrust of the cams.

The stamp receives its downward motion from the punch-block *H* and the adjustable jack *L*, and



Die for Piercing, Lancing and Stamping Drawn Brass Shell

may exist. As a matter of fact, only three of these pins have been broken within the last five years.
New York City B. J. STERN

COMBINATION PIERCING, LANCING AND STAMPING DIE

The die shown in the accompanying illustration was designed by the writer for piercing, lancing, and stamping the drawn brass shell shown at *W*. The piercing, lancing, and stamping dies are secured to, or made integral with, the sliding members *B*, *C*, and *D*, respectively. These members are confined within their respective slots by cover plates.

is returned to its former position by the action of the spring plunger *M* against the lever *N*, which, in turn, acts within the slot in the body of the stamp. A stop *O* is fastened to the top of the die-block to prevent the stamp from rising too high and to limit the movement of lever *N*. The piercing punch *B* operates at an angle of 60 degrees with the horizontal, this angular motion being obtained from the punch-block through the medium of the ball-and-socket joint of link *P*, which may be adjusted to the required position by means of the spanner nut *Q*.

The anvil *E* has two inserts *R*, the outer sides of which conform with the contour of the lancing punches *S*. A hole is made through anvil *E* so

that the piercing can drop out of the die. When the die is in operation, the workman slips a shell on anvil *E*, locating the shoulder of the smaller section against the shoulder *T* of the anvil. When the ram of the press descends, the shell is first pierced, then lanced, and finally stamped with the word "press," as shown in the detail view at *W*. The shell is then removed and replaced by a new piece of work.

Bridgeport, Conn.

J. E. FENNO

TILTING V-BLOCK CLAMP

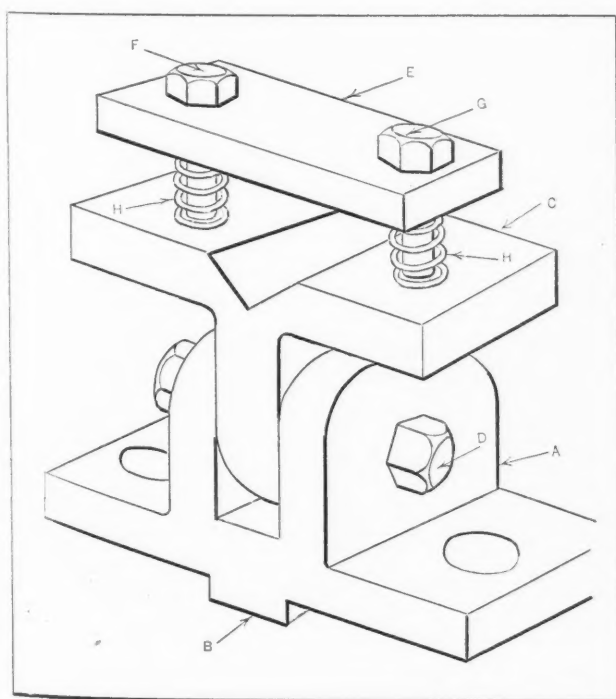
The tilting V-block shown in the accompanying illustration provides a means for quickly clamping work in place on a milling, drilling, or grinding machine and for setting it at practically any desired angle. The V-block clamp was primarily designed for milling diagonal cuts, hexagonal heads, cutters, counterbores, and other special shapes in a small shop where special and unusual jobs are handled.

The clamp consists of a base *A* of cast iron machined with a guide key at *B* for locating it on the bed of a milling machine; a V-block or plate *C* secured to the base by means of a bolt *D*; and a clamping strap *E* held down by two bolts *F* and *G*. Springs *H* serve to raise the clamp *E* when the screws *F* and *G* are loosened. Either cylindrical or flat work can be clamped by the use of the V-groove or the flat surface of block *C*.

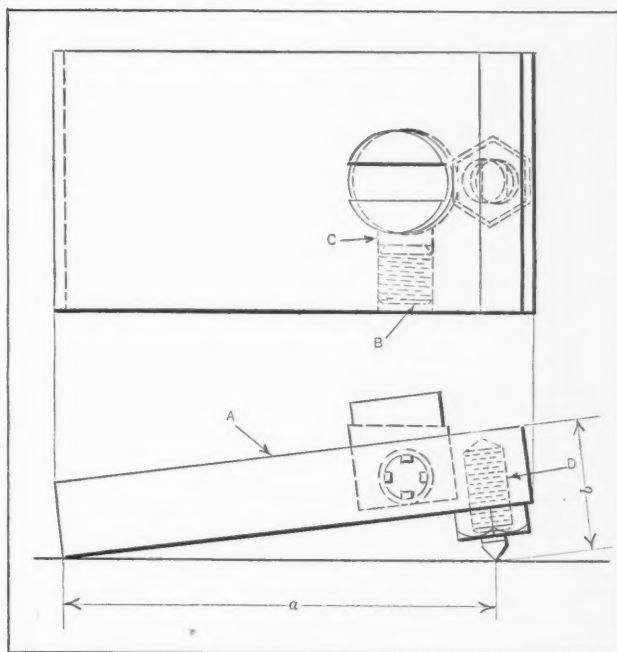
The transverse bolt *D* is of large diameter, and the comparatively thin vertical jaws of the base *A* spring sufficiently to clamp the block *C* in place when bolt *D* is tightened. A fixture like the one illustrated can be made at small cost from material available in nearly every machine shop. It is apparent from the illustration that the block *C* can be pivoted about bolt *D* and so adjusted as to bring the V-groove at any angle, ranging from the vertical to the horizontal position.

Washington, D. C.

G. A. LUERS



Clamp with Tilting V-block



Sine Plate Jig

SINE PLATE JIG

The sine plate jig here illustrated was made for grinding the sides and bottom of a slot in several sets of small cylindrical parts, each set of parts having the slot inclined at a different angle. The device is simple, and the angle can be readily checked by trigonometry, and as readily corrected.

The jig consists of a slab of machine steel *A* ground square, preferably on all six faces, and bearing near its forward end a socket to receive the part, which, in turn, is held in place by a set-screw *B* acting upon a plug *C*. Ahead of the part, a fine-pitch screw *D* is threaded into the bottom of the plate with a snug turning fit. The screw is made with a point from which the sharp corner is just stoned off, and can be turned by grasping it by a flattened portion formed just back of the point. After being adjusted, it is kept from moving by a lock-nut.

When the plate is set up on any plane surface, it will stand firmly supported on the back edge and the screw point. The angle can be easily established by measuring the distances *b* and *a* and calculating the sine of the angle. Here the particular advantage is that while distance *a* is established by means of a scale, the delicate part of the combination—distance *b*—is measured with the micrometer. As the scale can be read to sixty-fourths and the micrometer to thousandths, the error in the angle will always be small.

The jig as shown is intended for use in the vise of a milling machine or grinder and for checking the angle of parts already finished, by placing the jig with the part in it on a surface plate while the point of a dial test indicator is passed over the work. By stamping the micrometer measurements of distance *b* for the angles desired, on the plate, time will be saved in setting and checking the jig.

Two holes may be formed in the same jig to take care of work in which an angle is first to be milled and then finished by grinding, after the piece has been hardened and ground on its diameter. A particular advantage of a jig of this kind is that small

work can be readily examined by taking the jig and work out of the vise, and then be replaced with the assurance that the work will again be correctly aligned.

Jena, Germany

HENRY SIMON

CROSS-SLIDE TOOLS WITH SETTING GAGE

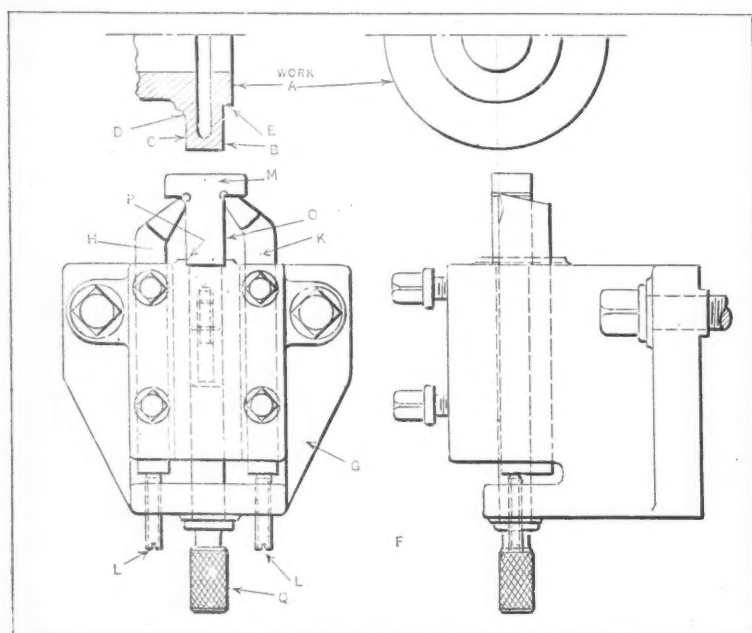
In modern milling fixture design, it is customary to provide the fixture with set blocks which are so located that the cutters can be set to the proper dimensions without difficulty. In turret lathe work, however, the tool designer seldom makes provision for obtaining correct settings of special tools, with the result that the operator has to resort to the cut-and-try method. Yet here it is sometimes more important and more troublesome than it is in a milling operation, because the tools may need to be removed, ground, and reset more frequently. An example of this kind is shown in the illustration, where the work *A* requires a straddle facing cut at *B* and *C* and, at the same time, the correct relation between *D* and *E* must be maintained.

In designing the special tool-block shown at *F*, the designer, realizing the difficulty of regrinding and resetting the tools in the usual way, made provision for the use of a tool-setting gage which greatly facilitated setting the tools to give the right dimensions. The block *G* is of cast iron, fastened to the cross-slide in the usual manner and provided with slots in which tools *H* and *K* can be adjustably set. The slots are somewhat wider than the tools to allow for considerable adjustment and to give longer life to the tools. Behind each tool is a set-screw *L* for fine adjustment.

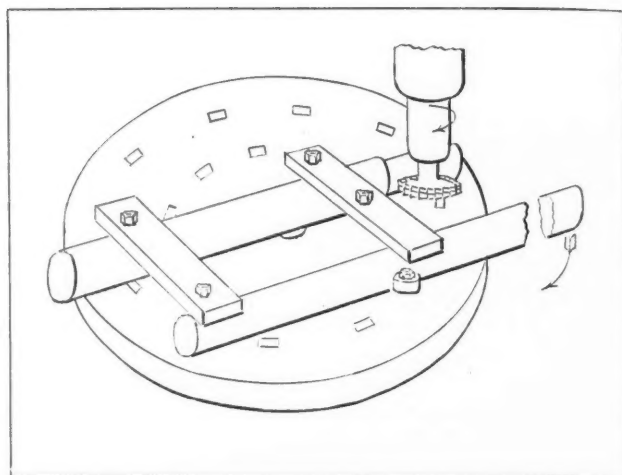
The gage shown at *M* is of hardened and ground steel and is squared at *O* to fit the slot *P* in the front of the tool-holder. A long screw with a knurled head *Q* is used to draw the setting gage back firmly in the slot and hold it there securely. When this is done, tools that have just been sharpened can be set against the gage, with the assurance that the setting will be accurate.

Detroit, Mich.

ALBERT A. DOWD



Tool-block with Gage for Setting Tools



Method of Cutting Keyway on Drilling Machine

KEYWAY CUTTING IN A SMALL SHOP

Recently it was found necessary to cut a Woodruff keyway in a 1 1/2-inch shaft of high-carbon steel in a small shop where the only machine available was an old upright pillar drill. The accompanying illustration shows how the machine was set up to handle the work. A Woodruff cutter was obtained with a shank that fitted the drill spindle. In order to obtain rigidity, the drill spindle was run up as high as possible in its bearings. The swinging table bracket was then locked on the pillar so that the drill spindle was located just inside the outer edge of the 15-inch work-table.

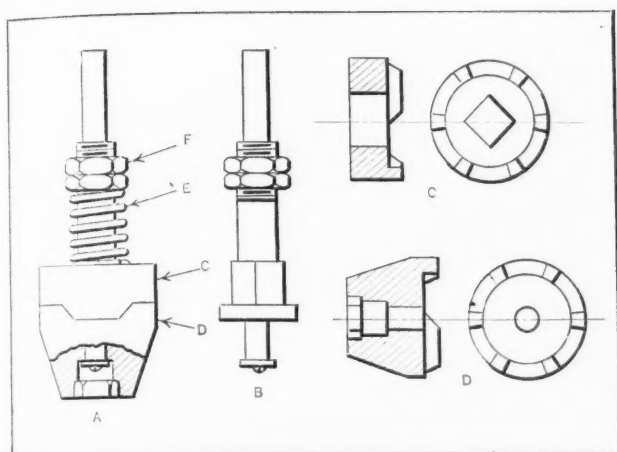
The height was adjusted to bring the cutter opposite the center line of the shaft in which the keyway was to be cut, the shaft being clamped in position across the table as shown. Stops were provided at the back of the shaft to take the thrust of the cut, and the set-screw for locking the table against rotation was tightened a little to minimize chatter. Feed was applied by rotating the table so that it moved the shaft toward the cutter, a bar being clamped to the table to give sufficient leverage for obtaining a steady pressure. The method of mounting the shaft facilitated accurate location of the keyway, and the depth was easily controlled.

The finished job left nothing to be desired, in spite of the fact that the steel in the shaft was very tough. Of course, a low cutter speed was used, and cutting lubricant supplied in large quantities.

Auburn, N. Y. WALTER S. BROWN

CHUCK FOR DRIVING NUT

The details of a chuck used on a drill press for driving small nuts are shown in the accompanying illustration. The object of this chuck is to draw the nuts up quickly with a uniform pressure or tightness without danger of stripping the threads. The completely assembled chuck is shown at *A*, and the spindle or shank section at *B*. The lower section *D* is provided with a socket for driving the nut. A section and plan view of the member *D* is shown in the lower right-hand corner of the illustration. This member is free to turn on the lower end of the shank, where it is



Chuck for Driving Nut

retained by a small screw and washer, as shown. In member *C* there is a square hole which is a sliding fit on the squared section of the shank *B*. The two members *C* and *D* interlock, as shown in the view at *A*, the interlocking edges being formed to an angle of 45 degrees.

The pressure of the spring *E* against part *C* holds it in contact with member *D*. As part *C* is driven by the shank, the motion is transmitted to member *D* through the interlocking edges. When the nut is drawn up with the desired pressure, the spring *E* is no longer able to hold part *C* in contact with member *D*, and the result is that member *D* ceases to revolve with part *C*. The nuts *F* provide for adjusting spring *E* to the required tension. For nuts up to the size of 10-32, a spring made of 0.035-inch music wire, spaced about 1/8 inch between coils, will be found satisfactory. For 1/4-inch nuts, 1/16-inch music wire is suitable.

Philadelphia, Pa.

R. H. KASPER

USING WOODWORKING TOOLS ON METAL

With the ever increasing use of aluminum and its principal alloy, duralumin, it is interesting to note the extent to which ordinary hand woodworking tools can be used on these metals. Aluminum, duralumin in the annealed state or just after heat-treatment, and soft brass can all be planed with an ordinary carpenter's block or jack-plane, the same as wood.

The blade of the plane used for these materials will require more frequent sharpening, however, and it is better to grind it to a sharper angle, which gives less clearance and a larger included angle, thus making the blade stronger and better able to resist wear on the cutting edge. The ordinary wood chisel may also be used on the metals mentioned, provided it is ground with a shorter bevel. The ease with which these soft metals can be worked with hand tools is surprising. They can be sawed with a coping saw or compass saw.

JOHN F. HARDECKER

Philadelphia, Pa.

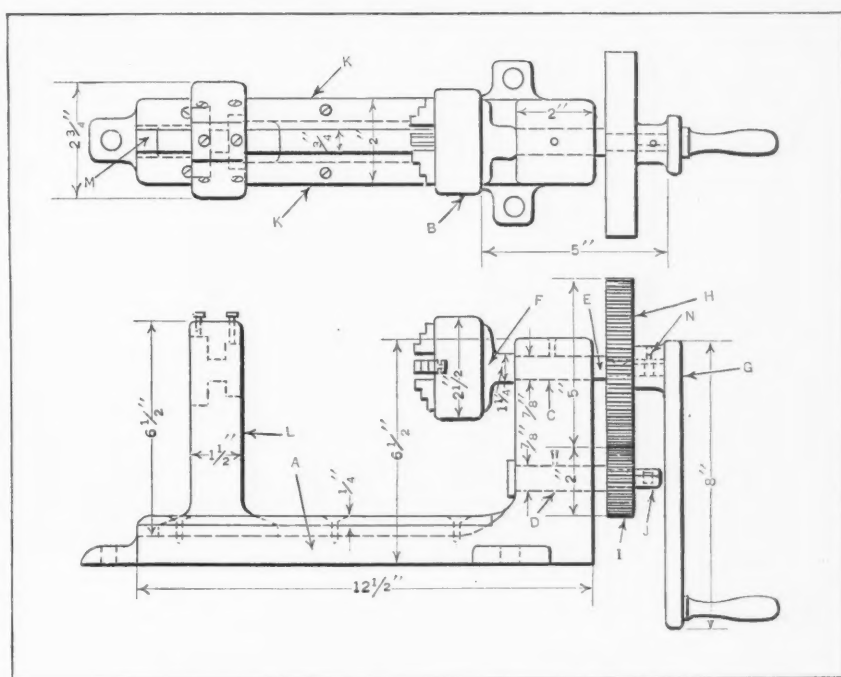
HAND TAPPING MACHINE FOR SMALL WORK

A simple hand tapping machine, suitable for threading and rethreading such parts as bolts, studs, handles, etc., and for tapping small parts of jigs and fixtures, is shown in the accompanying illustration. The machine can be bolted to one corner of the bench or it can be gripped in the vise and laid aside when not in use. The weight of the complete machine is less than 20 pounds, although it has the necessary capacity for threading a 1 1/2-inch bolt.

Referring to the illustration, *A* is an L-shaped casting having two holes *C* and *D* bored through the upright member. The main spindle *E* is 7/8 inch in diameter and has a large shoulder at *F*, which forms a back plate for the 2 1/2- or 3-inch self-centering chuck *B*. The other end of the spindle is squared to receive the crank-handle *G*. A steel ball at *N*, fitted in a small hole in handle *G*, is backed up by a spring which forces it into a corresponding spot in the spindle when the handle is in position. The steel ball retains the handle in place but permits it to be readily removed and transferred to shaft *J* when necessary.

The gear *H*, which is keyed to spindle *E*, is about 5 inches in diameter and has 50 teeth. The gear *I*, which meshes with gear *H*, is about 2 inches in diameter and has 20 teeth. The groove *M*, milled in the base, is machined to align accurately with spindle *E*. Two strips *K* of bright drawn steel, 5/8 inch by 1/4 inch, are secured to the machine base. As these pieces project over the groove *M*, they form a T-slot in which the die-holder *L* is fitted. The sides of the die-holder have recesses in them for receiving dies of standard outside dimensions.

In using the machine, the work is gripped in the jaws of chuck *B*, and a button die of the required size is placed in holder *L*. The crank-handle *G* is then slipped on the square end of shaft *J*. By turning the handle in an anti-clockwise direction, the gear *I* is made to drive gear *H* in a clockwise direction, with a reduction in speed of 2 1/2 to 1.



Hand Tapping Machine for Small Work

This reduction enables larger sizes of work, up to 1/2 inch, to be threaded with comparative ease.

In starting the thread, the die-holder must be pressed against the work, but after the thread is once started, the holder will be drawn along by the thread. When the required length of thread has been cut, the handle is transferred to shaft *N*, and the die quickly run off the work by turning the handle again in an anti-clockwise direction. When threading small work, or sizes below 1/4 inch, it is unnecessary to use the reduction gear, and the crank-handle *G* may be left on spindle *E* for both the forward and reverse movements. When tapping small work, the tap is held in the chuck and the work located in a fixture similar to the holder *L*. This work-holding fixture has a recess or nest in which the part is held.

London, England

ROBERT JULIAN

FORMULA FOR CHECKING V-BLOCK

In making work-holding V-blocks for jigs, fixtures, and other tools, it is sometimes more convenient to check the dimensions by means of a standard plug gage or rod instead of making a disk or cylinder of the same diameter as the work for checking purposes. The V-block is generally laid out according to the required dimensions *H* and *D* and the angle *a*, Fig. 2. The diameter of

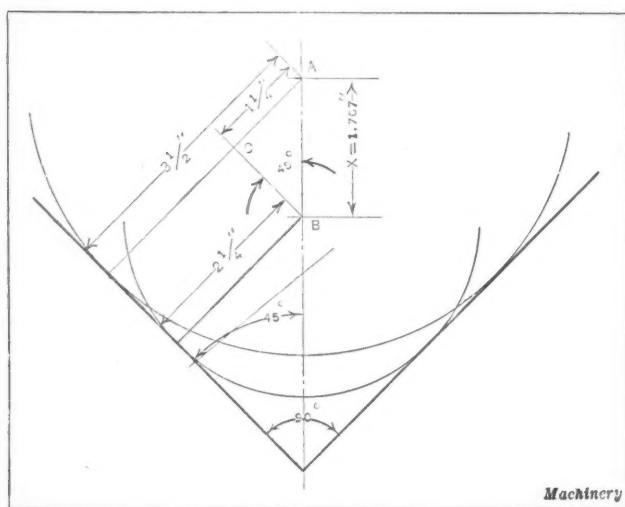


Fig. 1. Diagram Used in Obtaining Derivation of Formula

the work is indicated at *D*, and dimension *H* is made to suit the design.

When a plug gage or rod of the same diameter as the work is not available, a standard gage or rod of a different diameter may be used in checking the height *H*. The height *h*, with a plug or gage of larger diameter, will, of course, be greater than dimension *H* and will equal $H + x$. The formula for dimension *x* is

$$x = (R - r) \operatorname{cosec} a$$

In this formula *r* equals the radius of the work, *R* the radius of the plug or rod, and *a* one-half the included angle of the vee in the block. When angle *a* is 45 degrees, the formula becomes

$$x = (R - r) 1.4142$$

The latter formula is the one generally used, as most V-blocks are made with an included angle of 90 degrees.

An example of the application of the formula will serve to make its use clear. Let it be assumed that a V-block with an included angle of 90 degrees is to be made for a piece of work 0.800 inch in diameter, and that a plug gage 1.000 inch in diameter is to be used in checking the V-block.

Substituting the values of *R* and *r* in the formula, we have:

$$x = (0.500 - 0.400) \times 1.4142$$

from which

$$x = 0.1414 \text{ inch}$$

Adding 0.1414 inch to the given dimension *H* gives the required dimension *h*. Sometimes V-blocks are lapped at the point of contact with the work, in order to increase the bearing surface. In such cases, the formulas given here cannot, of course, be used.

[For those who may desire to know the derivation of the formula, a second example is shown in Fig. 1. In the triangle

ABC, we have *x* equals the side *AB*, and the difference between the radii equals $3 \frac{1}{2} - 2 \frac{1}{4} = 1 \frac{1}{4}$ inches, or the length of side *AC*. Then *AB* or *x* divided by the opposite side *AC* equals the cosecant of angle *ABC*. Therefore $x = 1 \frac{1}{4} \times 1.4142 = 1.767$ inch.—EDITOR]

Chicago, Ill.

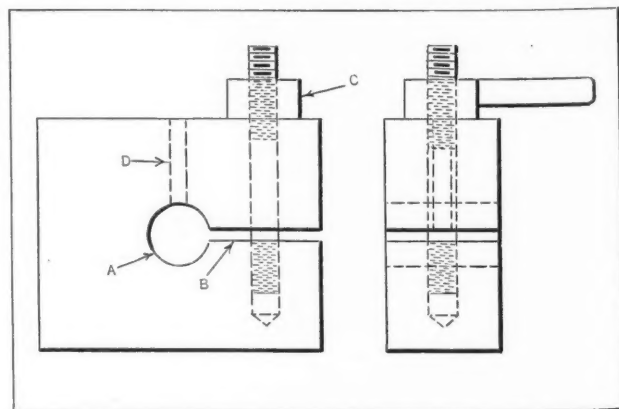
E. F. MURRAY

JIG FOR DRILLING CROSS-HOLE IN PIPE

The simple drill jig shown in the accompanying illustration was made for use in drilling small cross-holes in 3/4-inch pipe. The body of the chuck is a block of iron, 2 by 4 by 5 inches. The hole at *A*, which is just large enough to permit the pipe to slide through freely, is drilled completely through the block. The slot at *B* is cut with a saw 3/16 inch thick, and permits the block to be tightly clamped to the pipe when the nut *C* is tightened. As will be noted in the illustration, the clamping nut is provided with a handle. The hole at *D* serves as a guide for the drill.

Denver, Colo.

R. M. THOMAS



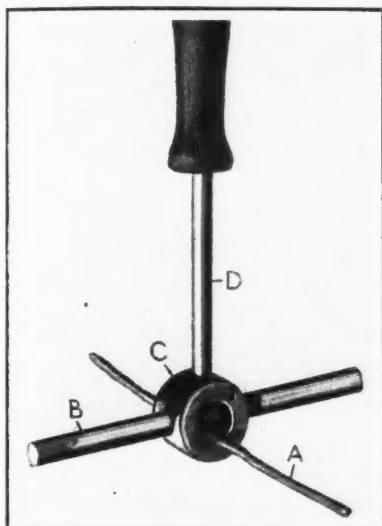
Drill Jig for Cross-hole in Pipe

Shop and Drafting-room Kinks

HOLDER FOR WIRE SOLDER

A holder for two thicknesses of wire solder, made as shown in the accompanying illustration, is a useful tool for the repair shop. Many tinning and joint sweating

jobs require varying amounts of solder during the procedure of the work, and it is sometimes difficult to apply just the right amount unless two sizes of solder are used. If a small quantity is required, the thin wire *A* is applied to the work, and if a larger quantity is needed, the thick solder at *B* is applied by turning the holder.



Holder for Wire Solder

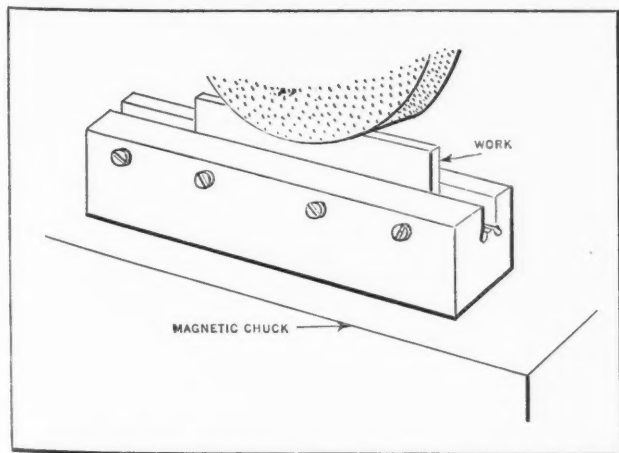
To make the tool shown, a collar *C* of suitable size is obtained, and a hole large enough to fit the large size solder is drilled through the collar. Then at right angles to the first hole is drilled a smaller hole which is tapped to receive the threaded end of the short rod *D*. The wooden handle is driven on a tang ground on the projecting end of rod *D*. The thick piece of solder *B* is passed through the drilled holes, and the thin piece *A* through the bore of the collar. By screwing rod *D* into the collar, both pieces of solder are secured in place.

Rosemount, Montreal, Canada

H. MOORE

GRINDING FIXTURE FOR GAGE AND TEMPLET WORK

Many tool- and gage-makers, when grinding the edges of gage and templet stock, clamp the work to a small angle-plate or resort to some makeshift



Grinding Fixture for Gage and Templet Work

method that wastes time. If for any reason, the work is required to be removed from the angle-plate, still more time will be wasted. The simple grinding fixture shown in the illustration permits the work to be quickly set for grinding or removed for measuring. With this fixture, the work can be reset without the use of an indicator. All sides of the fixture are made square and parallel, and the slots should be made square and parallel with the outside. For ordinary work, the slot should be about 1/4 inch wide by 3/4 inch deep. Four 1/4-inch set-screws on one side of the fixture serve to hold the work in place while grinding.

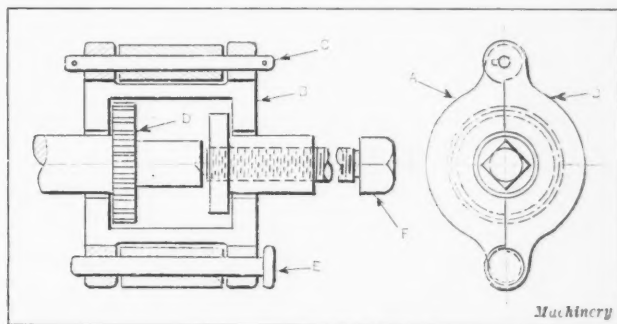
Syracuse, N. Y.

H. L. WHEELER

GEAR PULLER WITH HINGED SIDE

The usual gear or bearing puller is fitted with hooked holders which engage the under side of the gear or bearing while the pressure screw is forced down against the shaft end to remove the part. The hook type holders concentrate pressure on the work, and often injure a fine gear or bearing.

A puller designed to provide a uniformly distributed pull on the part without danger of mutilation is shown in the accompanying illustration.



Device for Removing Gear from End of Shaft

This type of puller is used in an engine repair station. It is made up of two semicircular parts *A* and *B*, hinged on the pin *C* at one side. In applying the puller, the cover *A* is swung back, the shaft with the gear *D* to be removed placed in the position shown, and cover *A* closed over the gear and locked in place by inserting pin *E*. The gear *D* can then be drawn from the end of the shaft by turning down the screw *F*.

Washington, D. C.

G. A. LUERS

* * *

A list, recently published, showing the amount spent for national advertising by different manufacturers indicates that fifty of the leading automobile manufacturers expended more than \$41,000,000—or an average of \$820,000 each—for advertising in national magazines and daily newspapers in 1926. These figures do not include the amounts spent in newspapers by local distributors and dealers. Four companies spent more than \$2,000,000; one, more than \$3,000,000; and one, over \$4,000,000.

Questions and Answers

NEGATIVE VALUE IN SOLUTION OF TRIANGLE

A. N.—In MACHINERY'S HANDBOOK on page 176 (sixth revised edition) there are two equations for finding the length of one side c of an oblique-angled triangle when sides a and b and angles C and A are known (see accompanying illustration).

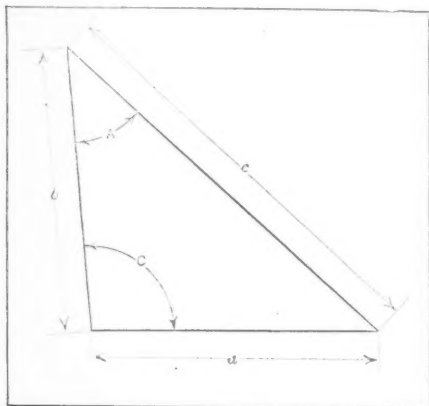


Diagram for Finding One Side of an Oblique-angled Triangle

Assuming that the sides a and b are each $5\frac{1}{16}$ inches long, the angle C between them is equal to 95 degrees, and the angle A is equal to $42\frac{1}{2}$ degrees.

Then, according to the HANDBOOK equation $a \times \sin C$

$$c = \frac{a \times \sin C}{\sin A} \text{ and side } c \text{ is } 7.4649 \text{ inches long,}$$

which is correct. If the HANDBOOK equation $c = \sqrt{a^2 + b^2 - 2ab \times \cos C}$ is used, the length of side c , according to my calculation, is 6.84. Thus: $c = \sqrt{5\frac{1}{16}^2 + 5\frac{1}{16}^2 - 2 \times 5\frac{1}{16} \times 5\frac{1}{16} \times 0.08715} = \sqrt{51.25782 - 4.467119} = 6.84$. Why do these two equations give different results?

A.—In applying the second equation to the example represented by the diagram, a mistake has been made, which accounts for the variation in the results obtained with the two equations. The cosine of an angle greater than 90 degrees but less than 180 degrees equals the cosine of the difference between 180 degrees and the given angle, or in this instance the cosine of 85 degrees. While this is the cosine used in connection with the second equation, it has not been given a negative value, which is essential, and should be applied not only to cosines, but to tangents and cotangents between 90 and 180 degrees, as shown by the table on page 171 of the HANDBOOK. Since the cosine is negative, the number 4.467119 obtained in your calculations is also negative; consequently, its numerical value must be added to the positive number 51.25782, because a negative number is added to a positive number in subtracting, as explained on page 106 of the HANDBOOK, where rules governing positive and negative numbers will be found. Thus:

$$c = \sqrt{51.25782 - (-4.467119)} = 7.4649 \text{ inches,}$$

which is the result obtained with the first equation.

MINOR EMPLOYED WITHOUT CONSENT OF PARENTS

H. T. T.—What is the legal status of an employer who employs a minor without the consent of the parents?

Answered by Leo T. Parker, Attorney at Law, Cincinnati, Ohio

A.—The liability of an employer for injuries sustained by an employee is based upon the well established law that an employer is not liable for the payment of damages for injuries sustained by an adult employee, if it is proved to the satisfaction of the Court that the workman was injured as a result of his own negligence. However, where an employer knowingly hires a minor without his parent's consent and requires him to do dangerous work, in the performance of which the minor is injured, the employer may be liable, even though the minor's carelessness or negligence may have contributed to a great extent to the occurrence of the accident which caused the injury; but if it is shown to the satisfaction of the Court that the minor falsely stated his age and the employer believed he was of legal age, the employer may be relieved of liability for injuries sustained unless the injury was due to the employer's neglect.

In a quite recently decided case, the Court explained that a parent is not entitled to recover damages for injuries sustained by a minor, unless the employer knows, or should have known by the exercise of good reasoning, that the workman was a minor. In this case, the Court held the employer not liable, because the boy verbally stated that he was of legal age, and signed a written application in which he verified the assertion.

In another case the Court said that it is the duty of parents to educate and maintain their child and, therefore, they are entitled to the child's services or the equivalent in money payment if he is killed or injured through the fault of another.

WELDING CRACKED CYLINDERS

A. S. C.—Is there any method by which automobile cylinders that are cracked as the result of freezing can be welded without preheating? We have tried several methods, including brazing with bronze and welding with nickel rod. An alternating-current electric arc welder has also been used, but with little success.

Answered by George F. Krieger, Wisconsin Rapids, Wis.

It was the writer's practice at one time to preheat the cylinders and weld the crack with cast iron. Once, when a quick repair job was required, a cracked cylinder was repaired by soft soldering. Finding that the cylinder repaired in this manner stood up all right, the soft soldering method was adopted and has been used for the last ten years.

The cylinders are preheated by running the engine for five minutes. The surface to be soldered is scraped, filed, and cleaned with muriatic acid. Soldering acid is next applied, and a good hot soldering iron of large size used to tin the surfaces. After the tinned surfaces have cooled, a thick layer of solder is applied, care being taken not to let the solder run down.

SEVENTY YEARS IN THE POWER TRANSMISSION FIELD

T. B. Wood's Sons Co., Chambersburg, Pa., manufacturer of power transmission machinery, is celebrating, this year, the seventieth anniversary of its establishment. Ever since its foundation, in 1857, this company has been identified with the manufacture of appliances for producing and transmitting power. Early in that year T. B. Wood, who was then master mechanic on the Franklin Railroad, now the Cumberland Valley Division of the Pennsylvania Railroad, entered into partnership with Peter B. Housum, a young millwright of considerable ability, under the name of Wood & Housum. They were prepared to manufacture steam engines, water wheels, mill gearing, shafting, pulleys, bearing boxes, etc.—in fact, everything required in the power plants of that day.

Mr. Housum, as captain of a company he himself had organized in Chambersburg early in 1861, was killed in the battle of Stone River, Va., the following year, and the business was continued by T. B. Wood under his own name until 1868, when a new partnership was formed under the name T. B. Wood & Co., which included his son George A. Wood and also the foreman of the shops, L. D. C. Houser. This partnership continued until 1884, when Mr. Houser retired and his place was taken by Theodore M. Wood, a younger son of T. B. Wood. At this time the name was changed to T. B. Wood & Sons, under which name it was continued until 1889, when T. B. Wood retired and his sons George and Theodore continued to conduct the business under the name T. B. Wood's Sons.

In 1906 the company was incorporated under the name T. B. Wood's Sons Co., with George A. Wood, president; Theodore M. Wood, vice-president; William H. Fisher, secretary; and Charles O. Wood, treasurer. In June, 1925, George A. Wood died, and his brother Theodore M. Wood was elected president, with Charles O. Wood as vice-president. Otherwise the personnel of the company is the same today as it was in 1906, except that Charles M. Wood, a son of Theodore M. Wood, is now also a member of the board of directors. It is quite remarkable that during the seventy years of the existence of this business only ten persons have been associated with its management, and of these six are now in the management of the company.

* * *

FIFTY YEARS WITH THE DISSTON COMPANY

On June 28, George L. Rogers, file works manager of Henry Disston & Sons, Philadelphia, Pa., celebrated his fiftieth anniversary with the Disston company. Mr. Rogers is a pioneer in the file industry, having operated the first saw file cutting machine to be put into operation by Disston in 1877. Through all his years with the company he has become widely known in the file business. Among both business friends and associates, as well as among the men employed by him, he is noted for his sincerity and good will. Henry Disston & Sons presented Mr. Rogers with a gold watch bearing the following inscription: "Presented to George L. Rogers by Henry Disston & Sons, Incorporated. Fifty years of faithful service 1877—1927."

THE DEMAND FOR ENGINEERING GRADUATES

According to an article by William T. Magruder, professor of mechanical engineering, Ohio State University, Columbus, Ohio, the demand for engineering graduates is greater than the supply. Reports for the last three years show, according to Professor Magruder, that an average of sixty-two organizations have applied directly to the department of mechanical engineering of the Ohio State University, asking each year for the services of 135 men from the graduating class, but the classes have averaged only forty-seven men; hence, three positions were available for almost every graduate. In the last college year, there were thirty-eight men in the graduating class in mechanical engineering, while ninety-five corporations or companies applied for the services of 174 engineering graduates. In this case, the demand was 4.6 times the supply, so that several of the men had an opportunity to choose between four or more positions. This would indicate that in spite of the large number of men graduating from the engineering schools of the United States, the demand for men in the mechanical engineering field, at least, is greater than the supply.

* * *

ELECTRIC HOIST MANUFACTURERS ELECT OFFICERS

The Electric Hoist Manufacturers' Association, with headquarters at 165 Broadway, New York City, at its last annual meeting, elected G. A. Mitchell chairman of the association, and re-elected A. F. Roeper vice-chairman, and E. Donald Tolles, secretary-treasurer. At the meeting the business of the past year was reviewed, the statement being made that no great change has taken place in the field during the last two years, although there has been a definite gain in export distribution.

The association maintains a method of reporting statistics, so that the quantities of hoists manufactured are now segregated under standard rating sizes, giving an accurate idea of the trend of the business in different hoist capacities. The engineering committee of the association has prepared a complete and interesting study on the comparative specifications and details of the various makes of 1/2-, 1-, and 2-ton electric hoists. A comparative report was also presented showing the number of hoists sold during the years 1922 to 1926, inclusive, and the various lines of industry that absorbed the volume of hoists manufactured.

* * *

RAILWAY TOOL FOREMEN'S MEETING

The annual meeting of the American Railway Tool Foremen's Association will be held at the Hotel Sherman, Chicago, Ill., August 31 to September 2, inclusive. Among the topics that will be discussed at this convention are Standardization of Locomotive Taps and Dies; Improvements in Railroad Shop Work Through the Use of Standard Gages and Measuring Systems; Heat-treatment Methods and Equipment for Small and Large Railroad Shops; and Small Tools, Jigs, and Devices for Locomotive and Car Shops. Further information may be obtained from the secretary, G. G. Macina, 11402 Calumet Ave., Chicago, Ill.

The Machine-building Industries

THE general business prospects—upon which depend the conditions in the machine-building industries—may be appraised from many different points of view; and, to some extent, the conclusions arrived at will depend upon the angle from which the conditions are observed. The Federal Reserve Bank states that industrial production increased in May—the last month for which complete statistics are available—and continued at a higher level than a year ago. There has, however, been a noticeable slackening in certain branches of industrial activity, especially in the iron and steel industry and in the automobile field. Car loadings, although still exceeding the million mark each week, are slightly below the figures for corresponding weeks last year; but the total for the year, so far, is greater than for 1926.

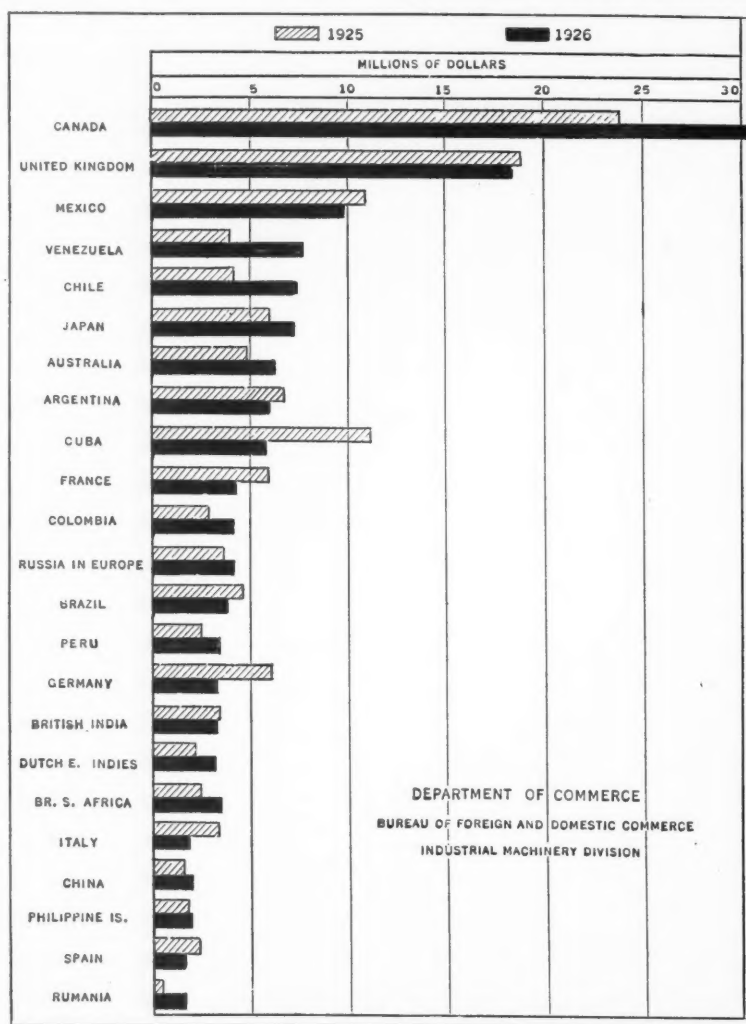
Engineering construction, one of the important barometers for gaging business activity, continues to run ahead of last year, and the total value of contracts awarded for the first six months of the year amounted to \$1,515,000,000 as against \$1,360,000,000 last year. Building permits, however, are about 8 per cent less, as compared with 1926, according to S. W. Straus & Co.; but contracts awarded in June, according to the F. W. Dodge Corporation, broke all monthly records.

In the iron and steel industry, there has been a marked reduction in output. Several blast furnaces have been blown out, and the United States Steel Corporation has reduced its operations to about 75 per cent, which is about 10 per cent less than a year ago. The entire industry, it is estimated, was working at about 70 per cent of capacity the middle of July. No further reduction is anticipated.

The machine tool industry has experienced no appreciable change during the last two months. The total number of orders placed in June were slightly greater than in May, but it is difficult to

predict whether business during the remainder of the summer will be maintained at about the same level or again slightly decline. Ernest F. DuBrul, general manager of the National Machine Tool Builders' Association, points out that many large companies have been making good profits, as confirmed by their annual reports, and that these larger companies are likely to be the best customers for machine tools at the present time. These concerns have made their profits by using productive machinery, and are likely to continue to buy such equipment in order to hold their own in the future.

The accompanying chart shows a comparison of the exports of industrial machinery during 1925 and 1926. It is significant to note that, in spite of everything that has been said about the cost of production in foreign countries and cheap European competition, this country is still able to export great quantities of machinery to European countries—\$38,000,000 worth last year. As pointed out by the Industrial Machinery Division of the Bureau of Foreign and Domestic Commerce, by whom these statistics have been compiled, Canada, as usual, is the largest single buyer of industrial equipment. It is of interest to note that the machinery trade with Russia has expanded from \$64,-



Exports of Industrial Machinery from the United States, 1925 and 1926

000 in 1922 to \$4,100,000 in 1926.

The exports of industrial machinery during May, the last month for which complete statistics are available at this writing, exceeded those for May, 1926, by nearly \$3,000,000. The value of metal-working machinery exported in May, 1927, was \$1,892,000, as compared with \$1,319,000 in May, 1926. The exports of metal-working machinery for the first five months in 1927 exceeded those for the corresponding months of 1926 by about 15 per cent.

The automobile industry continues at about the same level of production as last year.

New Machinery and Tools

The Complete Monthly Record of New Metal-working Machinery

MINSTER ADJUSTABLE-BED PRESSES

Adjustable-bed horning and wiring presses are being placed on the market in six sizes by the Minster Machine Co., Minster, Ohio. These presses have a ram pressure of 12, 16, 22, 32, 45, and 56 tons, respectively, while their weights range from 1200 to 9200 pounds. The three smaller presses are furnished with a flywheel drive only, whereas the three larger presses can be furnished with either a flywheel or a back-gear drive. When an individual motor drive is desired, power may be delivered through a belt or direct gears, on any style of machine. In addition to wiring and curling operations the presses can be used for cutting, drawing, forming, combination and similar operations.

These presses can be used either with the standard table in the position shown in Fig. 1 or with the table swung outward, as illustrated in Fig. 2. Also, the table can be replaced by special fixtures. While the table is not regularly furnished, it will be found indispensable if the machine is to be used for blanking, forming, or similar operations. It has a large opening which can be utilized for "push through" work, and it is hinged to the frame, so that it can be swung aside readily. Alignment is obtained by means of a vertical slot in the face of the press, the table being securely held in position by means of four studs which extend through the slots in the frame. The table is adjustable for height by means of a screw and handwheel. A standard bolster plate is furnished with the table.

The main bearings of the machine are overhung,

so that the upward thrust of the crankshaft is centered in the solid casting and is not borne by the caps. The clutch is of an improved sliding dog type. The engaging surfaces on the clutch switch and clutch pin are tapered, so that the action is positive under all conditions. The clutch switch is arranged to act as a positive stop in case of brake failure and, because of this provision, the press cannot repeat unless the treadle is held down. A safety pin has been provided in the clutch to permit dies to be set while the flywheel is in motion. The largest geared type press (No. 6) is equipped with a three engagement point block-type clutch.

The slide moves in long V-shaped gibs, which are scraped to a fit. Adjustment for wear is taken up from one side, with the result that the gib on the opposite side is always in a rigid position and facilitates obtaining accurate alignment. The bearing part of the slide is furnished with deep oil-grooves to insure ample lubrication. The punches are held in the slide by means of an adjustable cap. Lugs cast on the side of this cap facilitate fastening wide punches or holding stripper attachments. A positive cross-bar knock-out is furnished in the slide, and knock-out brackets are attached to the frame.

The pitman connection is of the ball screw type, the screw being rigidly clamped in the pitman. It is of large diameter and has a hexagon milled at the end of the thread for adjusting the slide. The brake that controls the crankshaft is easily adjusted and is furnished with a non-burn lining. A safety trip attachment can be provided to make

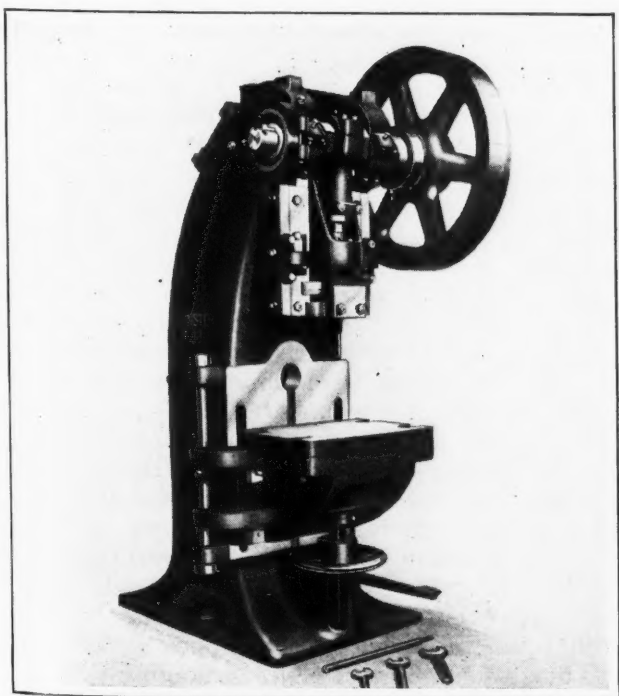


Fig. 1. Minster Adjustable-bed Horning and Wiring Press

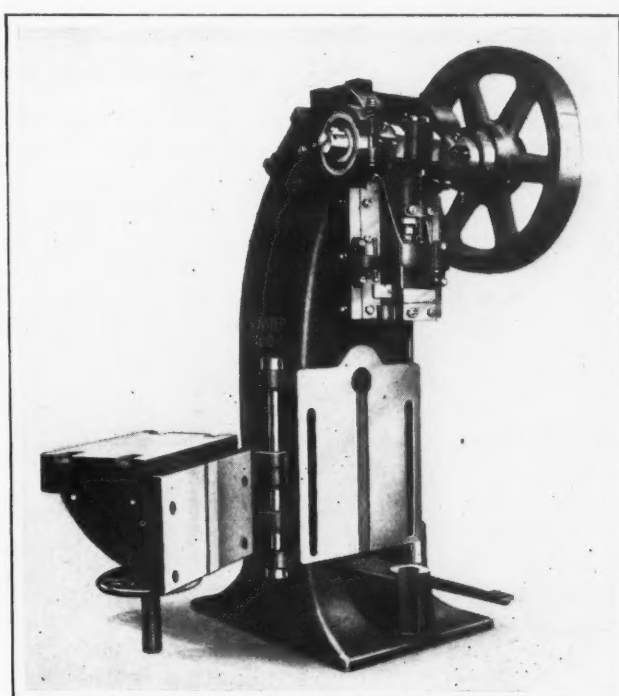


Fig. 2. Press with Table Swung Aside

it necessary for the operator to lift his foot after each revolution of the crankshaft.

The crankshaft is a hammered steel forging, with the clutch body solid. The main bearings are ground to give a smooth running fit, and they are unusually long to insure rigidity. On the flywheel types of presses, the motor speed is 900 revolutions per minute, and on the geared types, 1200 revolutions per minute. The standard stroke of the slide of the different presses in the line ranges from 1 1/2 to 3 inches, and the maximum stroke from 3 to 6 inches.

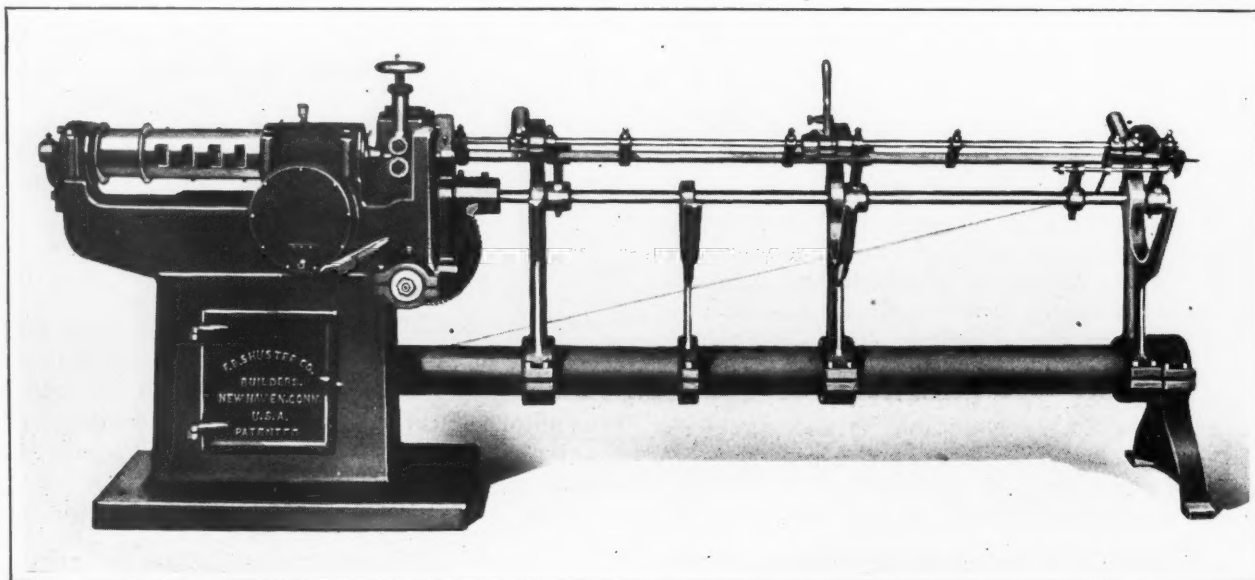
SHUSTER WIRE STRAIGHTENING AND CUTTING MACHINE

Only one belt is required to drive an automatic wire straightening and cutting machine recently developed by the F. B. Shuster Co., New Haven, Conn. This belt transmits power to the arbor, the latter acting as the main driving shaft for the entire machine. The feed-rolls and cutting-off mechanism are driven from this arbor by means of a

FOSTER UNIVERSAL TURRET LATHE

Two types of a new No. 5 universal turret lathe are being introduced on the market by the Foster Machine Co., Elkhart, Ind. One of these types has an eight-speed all-gear head, and the other, a six-speed cone head. Each type has a capacity for 1 13/16-inch round bars through the automatic chuck, and a swing of 17 1/2 inches over the ways and 9 1/2 inches over the cross-slide. The bed of both types is cast integral with the head, and is provided with V-type ways for the carriage. The carriage is gibbed to the under side of the ways.

The cone-head machine is provided with a three-step pulley and back-gears. Clutches of the cone type, operated through a yoke and lever, are employed. The hole through the spindle is 2 1/8 inches in diameter, and by placing the automatic chuck-operating mechanism on the rear of the machine, the shortest possible overhang of the spindle nose is obtained, thus providing a rigid support for the collet or chuck. Six spindle speeds and reverse are obtainable through the double friction countershaft regularly supplied.



Shuster One-belt Automatic Wire Straightening and Cutting Machine

hardened tool-steel worm and bronze worm-gear, running in oil. The arbor is mounted in Timken tapered roller bearings.

The wire is fed through the straightening arbor and into a covered guide bar in which is located an adjustable gage that may be set to cut the wire to any length within the capacity of the machine. This gage is connected with a clutch on the camshaft, and when the wire strikes it, the clutch is thrown in and the cutting mechanism starts instantly. At the same time, the cover of the guide bar opens and the cut piece drops out into the forked holders provided for this purpose.

The base of the machine may be extended so that a motor can be mounted on it and connected by belt to the arbor through slots in the bed. Such an arrangement gives a self-contained machine. A motor may also be placed on the floor or ceiling and belted to the arbor. Guards are provided wherever necessary, but they are omitted in the illustration, in order that the working parts can be clearly shown. This machine is built in three sizes.

All speed changes of the geared-head machine may be obtained without stopping the machine, through multiple-disk clutches and one sliding gear. All operating levers for controlling the speeds are located on the head, convenient to the operator. A separate clutch on the front shaft of the machine provides for reversing the spindle, this reverse action being confined to the spindle alone, not another gear in the entire train being reversed. The machine can be driven from a countershaft or direct from a motor mounted on the head, through a silent chain. A motor can also be mounted on the rear leg, driving through a belt. The builder recommends a three-horsepower motor running at 1800 revolutions per minute.

Six longitudinal feeds, which are reversible, are provided for the universal carriage. Likewise, six feeds are obtainable for the cross-slide. Both the carriage and cross-slide are equipped with adjustable stops for automatically disengaging the feeding movements. The clutches that control these movements are adjustable from outside the apron.

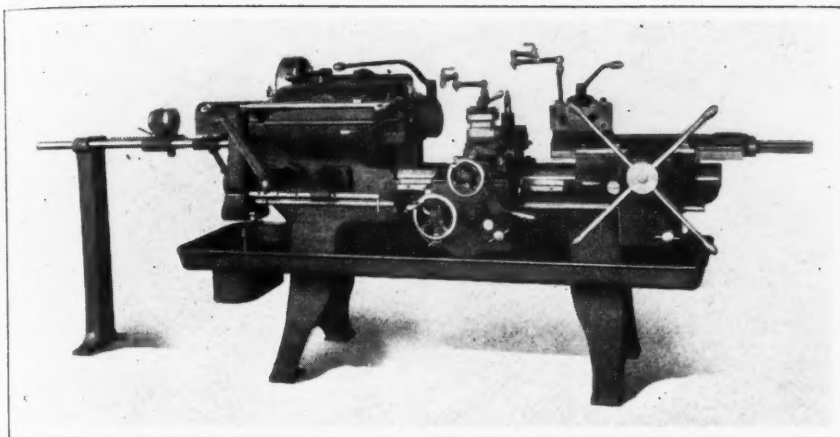


Fig. 1. Foster Turret Lathe with Eight-speed All-gear Head

The square turret mounted on the cross-slide is detachable. It is provided with a ratchet mechanism for effecting the indexing movement through the binder lever. A lock-bolt, which retains the indexed positions, is located directly beneath the tool in action.

The hexagon turret is held centrally by a hardened steel stud pressed into the slide. A taper bearing is formed between the stud and a sleeve pressed into the turret, provision being made for close adjustment of this bearing. The turret indexes automatically through the backward movement of the slide, a positive stop absorbing all shock at the final indexing moment. Through six independent stop-screws, the power feeds may be ended at any predetermined point. The effective turning movement is $10 \frac{3}{4}$ inches, and the maximum distance from a turret face to the spindle nose is 20 inches. Six power feeds are also available for the turret-slide.

The automatic chuck is of the master collet type, with bushings for each size and shape of bar. Either a draw-in or push-out chuck can be supplied. The bar feed consists of a sliding stock head, which is carried on two parallel bars and operated by the same lever that controls the automatic chuck. The cone-head machine weighs about 3000 pounds, and the geared head machine, 3155 pounds.

KANE & ROACH STRAIGHTENING MACHINE

For straightening bars sidewise, as well as on the top and bottom, Kane & Roach, Inc., Syracuse, N. Y., has recently produced the No. 2A horizontal and vertical roll straightener here illustrated. The machine is shown arranged for handling hexagonal stock, but by

the use of proper rolls, it will accommodate any of the various shapes and sizes of stock that can be straightened on the standard rolls of the company. As received for straightening, the material handled by this particular machine has a bow of from 15 to 30 inches in a 25-foot length. The machine delivers this material commercially straight after one pass through the rolls at a speed of 125 feet per minute.

The machine is mounted on a single bedplate, and one motor of 25 horsepower rating drives all three units. The pyramid straight-

ening unit located at the feed end and the vertical roll shaft unit are driven by means of roller chains, while the horizontal roll shaft unit is gear-driven directly from the motor. The pyramid unit can be supplied or omitted. In the machine illustrated, it is used to remove the bow in the material, so that the effect of the horizontal and vertical units will be more uniform.

Both the vertical and horizontal roll shaft units are provided with an independent adjustment for the upper rolls. In addition, the vertical shaft unit as a whole is adjustable in and out. With this construction, the center line can be maintained for material of various diameters. Scales and pointers are provided, so that a record can be kept of the various settings.

The machine has a capacity for from $\frac{3}{8}$ -to $1 \frac{1}{4}$ -inch hexagonal stock or proportionate shapes. The particular machine illustrated is employed for handling hexagonal stock from $\frac{7}{16}$ to $1 \frac{1}{8}$ inches, varying by sixteenths of an inch. Only one set of rolls is required to accommodate this range. The machine

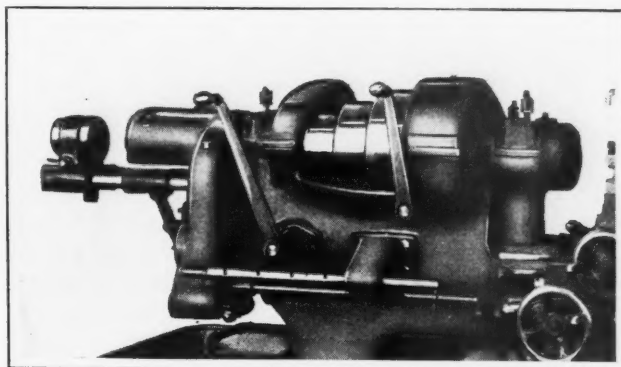
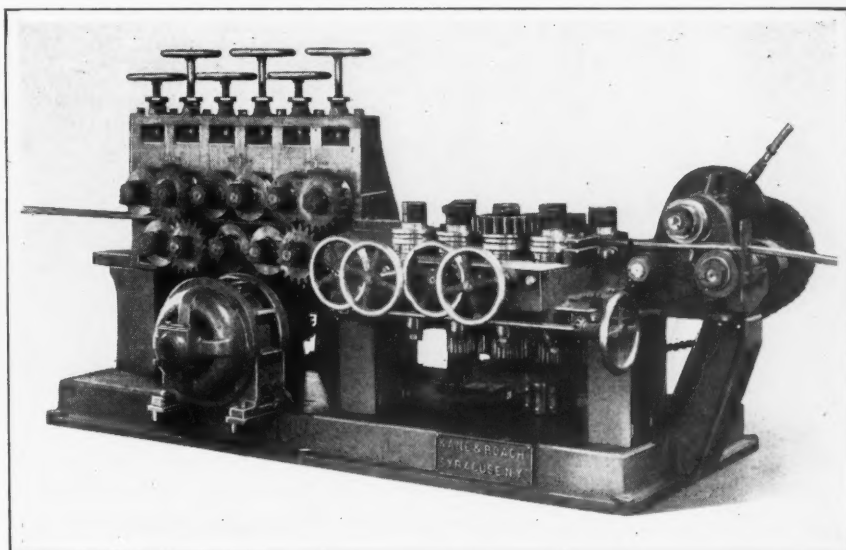


Fig. 2. Six-speed Cone Head for Foster Turret Lathe



Kane & Roach Horizontal and Vertical Roll Straightener

is built in several sizes, and can be modified to meet specifications. Instead of the twelve-roll horizontal shaft unit, an eight-roll unit can be supplied.

LANGELIER AUTOMATIC DRILLING UNIT

Drilling, reaming, counterboring, hollow-milling, and similar operations can be performed with an automatic drilling unit recently developed by the Langelier Mfg. Co., Arlington, Cranston, R. I. Tapping can also be performed by the use of a reversing tapping chuck, and multiple-spindle heads can be mounted on the feed sleeve. The unit is built in three sizes: The No. 11 will drive drills up to 3/16 inch in steel, and can be geared to give from 10 to 50 cycles per minute with speeds as high as 8000 revolutions per minute; the No. 21 unit will drive drills up to 3/8 inch in steel, and can be geared to give from 5 to 25 cycles per minute with speeds up to 6000 revolutions per minute; the No. 31 unit will drive drills up to 3/4 inch in steel, and can be geared to give from 5 to 20 cycles per minute with speeds as high as 3000 revolutions per minute. The different sizes will operate vertically, horizontally, or at an angle, without requiring any change in construction.

Fig. 1 shows three units being used vertically. They are driven by individual motors through change-gears. This particular machine was built for drilling the heads of safety screws. Fig. 2 shows two units used in a horizontal plane as a

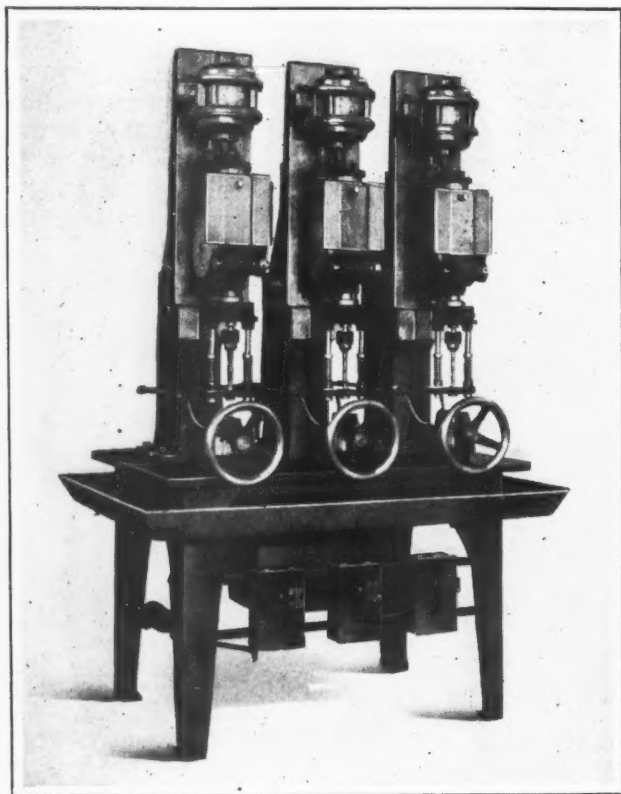


Fig. 1. Three Langelier Drilling Units Mounted Vertically

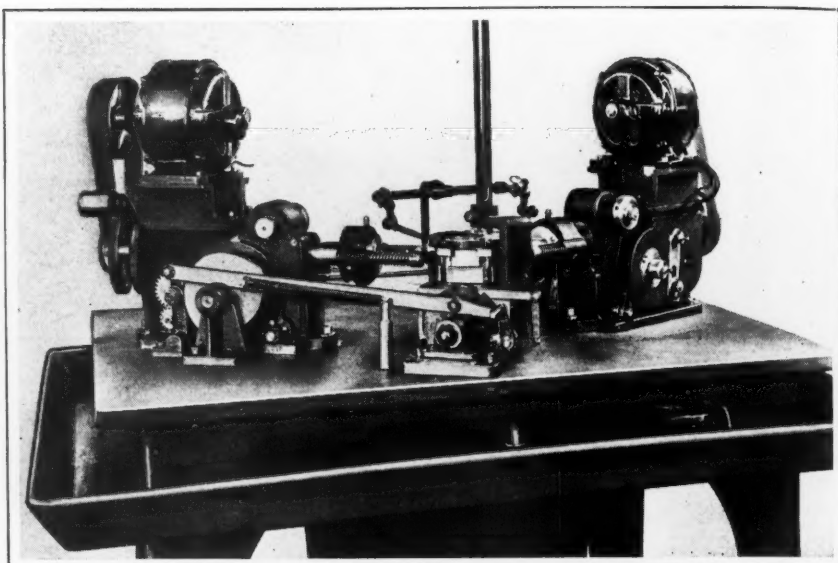


Fig. 2. Special Drilling Machine Made up of Two Langelier Drilling Units

special automatic drilling machine. This particular machine is equipped with a magazine and dial feed for drilling and countersinking gasoline-engine piston-pins.

The unit can be driven either from an individual motor through change-gears, as shown, or by a belt connected directly to the spindle. The latter runs at the same rate of speed as the driving pulley or gear. Feed of the spindle is accomplished through worm-gearing and a set of change-gears which drive a hardened steel cam. The cam is cut to give the proper quick advance, feed, pull-out, if required, and quick return, for the particular operation for which the unit is intended. The change-gears, as well as the feed-cams used for obtaining different cycles of operation, are quickly accessible and easily changed. After being set in motion by releasing the clutch lever, the unit will make one complete cycle and return to the starting position. It can also be operated continuously by locking the clutch lever in the depressed position.

One of the features of the unit is that it can be used for other operations than that for which it was originally intended, by merely changing the feed-cam. It is particularly adapted for use in special machinery, and can be arranged to perform as many as six different operations in conjunction with dial or magazine feeds. In the event that the work for which a machine was originally built becomes obsolete, the automatic units can be disassembled and employed as single-spindle drilling machines or can be rearranged on the same table to take care of changes in the operations or to perform different classes of work.

GENERAL ELECTRIC LIMIT SWITCH

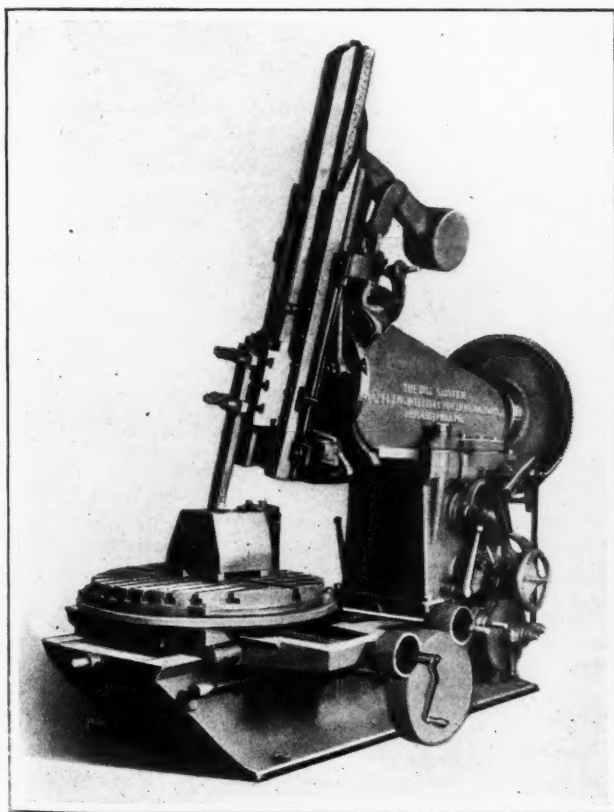
A small limit switch that may be used on machine tools for such operations as stopping carriages at the end of their travel has recently been brought out by the General Electric Co., Schenectady, N. Y. This switch has many other applications where normally open and normally closed contact is required. The switch is made of cast iron, is arranged for conduit connection, and is dust-tight. To change over from normally open to

normally closed operation, it is only necessary to remove a few screws, reverse a finger block, and replace the screws. The operating arm of the switch can be set at any angle, and an arm can be provided for mounting on either side of the switch.

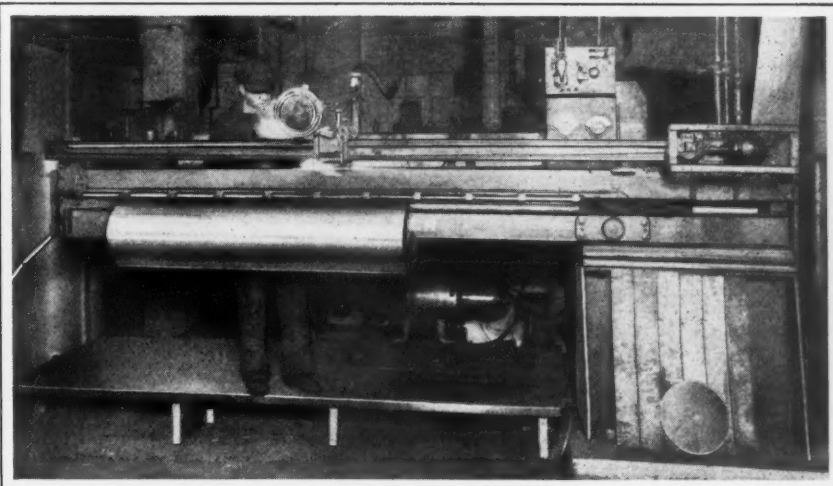
DILL ANGLE-CUTTING TRAVELING-HEAD SLOTTER

Dill traveling-head slotters, which are built by the Nazel Engineering & Machine Works, 4043 N. Fifth St., Philadelphia, Pa., may now be equipped with an angle-cutting head. This head may be swiveled 15 degrees on each side of the center, making the slotter universal, so that angular surfaces can now be machined at one setting, whereas a setting was previously required for each side. The illustration shows a 24-inch slotter equipped with the angle-cutting head.

The angle-cutting head, with the ram and ram guide, forms a separate unit. It is fitted on a hub at the front of the traveling head, which is turned concentric with the crankshaft, and it is securely clamped at the top and bottom. Adjustments of the angle-cutting head are obtained through a worm, which is secured by brackets to the traveling head, and through a worm rack that is bolted to the angle-cutting head. For accurate adjustment, a dial, graduated in minutes, is placed on the worm angle-adjusting shaft. The ram guide for the angle-cutting head is fitted with taper gibs at the top and bottom, which prevent springing from the cutting thrust.



Dill Universal Angle-cutting Traveling-head Slotter



Lincoln Automatic Carbon Arc Welder

LINCOLN AUTOMATIC CARBON ARC WELDER

An automatic carbon arc welder, designed for welding range boilers, has recently been placed on the market by the Lincoln Electric Co., Coit Road and Kirby Ave., Cleveland, Ohio. On No. 14 gage steel, this welder operates at a speed of 150 feet per hour.

The side seam is welded with a filler rod, which is laid on the seam and fused into the joint by the carbon arc. The range boiler is first slipped on the mandrel of the machine and top clamps are made to hold the seam in position. Water-cooled copper guards confine the arc to the seam. The clamps also carry the upper rail, on which is mounted the carriage for the automatic welding head. The operator merely starts the arc in operation, the motor-driven head being carried along the seam to fuse the filler and the seam edges together.

While the equipment is built primarily for producing the completely welded range boiler, it is also adapted for welding riveted-and-welded range boilers.

ANDERSON POWER SCRAPER

For use in scraping flat surfaces on machine tools to an accurate bearing, the Anderson Brothers Mfg. Co., 1910 Kishwaukee St., Rockford, Ill., has recently developed the power scraper here illustrated. The scraper tool is mounted on an arm, and a reciprocating movement is imparted to it by a rack and pinion drive. The motor is coupled to the scraper tool through gears and clutches in such a manner that when the operator pushes a control sleeve forward, the scraper tool is driven forward. When the operator pulls the sleeve backward at the end of the forward stroke, a reverse drive is engaged to pull the tool back. With this arrangement, the scraper is operated in the same manner as a hand tool, except that no manual effort is required. The operator uses his left hand to operate the sleeve.

The control is very sensitive, a movement of only 1/16 inch being required to obtain the reversal. With the sleeve held forward or back, any desired length of stroke may be imparted to the scraper tool. The forward stroke is at the rate of 60 feet per minute, and the return stroke at the rate of

90 feet per minute. With the sleeve in the neutral position, the drive is disengaged and the scraper arm can be pulled forward or pushed back over a range of 5 feet, in order to bring the tool into the required position. With a machine of this type, it is possible to scrape faster than by hand, and the fatigue factor is entirely eliminated, which results in increased efficiency of the operator.

The arm on which the scraper tool is mounted can be instantly pushed or pulled the length of 5 feet. There is also a power-driven screw, engaged by means of a hand-lever, which provides for raising or lowering the head to bring the tool to the most convenient angle for scraping. A ball-bearing swivel on the column permits the tool to be easily swung around a complete circle. With these three adjustments, the machine is exceptionally flexible,



Anderson Power-driven Scraper

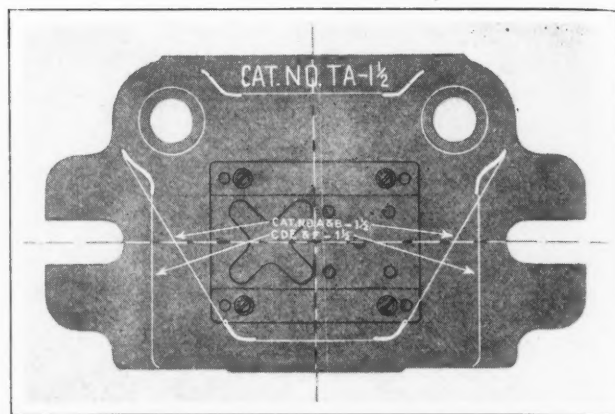
and the tool can be easily brought into the required positions.

At the base of the machine there is a lever, by means of which four truck wheels can be lowered and the base elevated from the floor, so that the whole machine can be readily drawn to any part of the shop. In addition, there is a yoke at the top to receive a crane hook for carrying the machine through the shop.

Power for driving the machine is provided by a 1/4-horsepower motor, which takes current from a lamp socket. This motor is furnished with a circuit breaker, so that if the scraper tool should come up against a shoulder or other obstruction, the power would be shut off before damage could be done. The sleeve employed in imparting reciprocating movements to the scraper tool is normally held in the neutral position by means of springs.

DANLY TRANSPARENT TEMPLETS

Transparent templates which simplify the choice of die sets for any given job have been added to the line of diemakers' equipment and punch-press accessories made by Danly Machine Specialties, Inc., 2112 S. 52nd Ave., Chicago, Ill. These templates are used in determining the size and type of die set re-



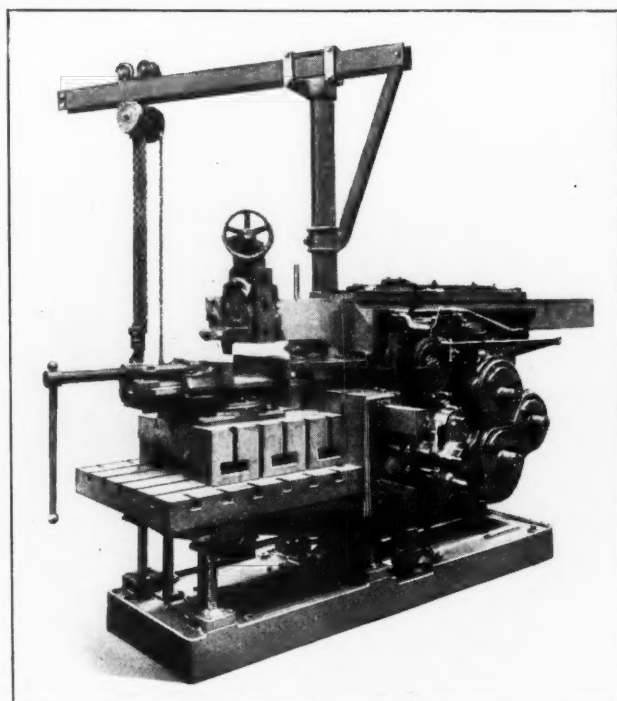
Danly Transparent Templet for Die Sets

quired for a die as laid out on the drawing-board. The templates consist of a tough material, through which the details of a die drawing can be seen, as shown in the illustration. With the die laid out, all that is necessary is to place templates on the drawing until the templet corresponding to the direct size of die set is found.

Thirty different templates are included in the complete outfit, and these are sufficient to cover the 14 types and 113 sizes of Danly die sets. Ordinarily, a company not making a wide variety of stampings finds from two to four templates sufficient. A rubber stamp is furnished for stamping a tracing or blueprint to indicate the required die set.

MORTON HEAVY-DUTY DRAW-CUT SHAPER

A new 60-inch stroke heavy-duty draw-cut shaper of the four-screw type is being announced to the trade by the Morton Mfg. Co., McKinney Ave. and Hoyt St., Muskegon Heights, Mich. It is manufactured with 36, 48, or 60 inches of horizontal or side feed on the cross-rail, and with 18 inches of vertical feed. In general construction, the machine is similar to other heavy-duty draw-cut shapers built by this company, except for the



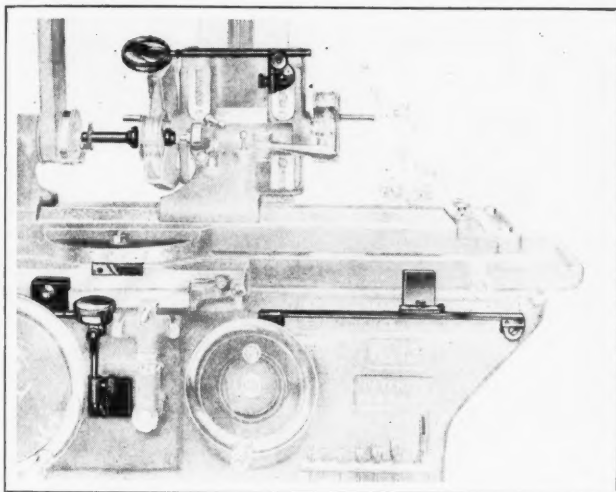
Morton Heavy-duty Draw-cut Shaper

size of the ram, column, cross-rail, and bed, which have been increased to accommodate larger work and permit heavy-duty production.

The machine is equipped with a crane and hoist, auxiliary top table, heavy steel vise, large T-slotted table and set of O. K. tools and holders. It can also be furnished with a special tilting vise for frog and switch work.

GRINDING EQUIPMENT FOR CIRCULAR FORMING TOOLS

Contours of screw-machine forming tools and work of a similar nature can be ground to advantage with equipment recently developed by the Brown & Sharpe Mfg. Co., Providence, R. I. This equipment is intended for use on the B. & S. No. 13 universal and tool grinding machine. It is made up of several units which may be furnished either as a complete equipment or separately. The equip-



Brown & Sharpe Grinding Machine Equipped for Grinding Circular Forming Tools, etc.

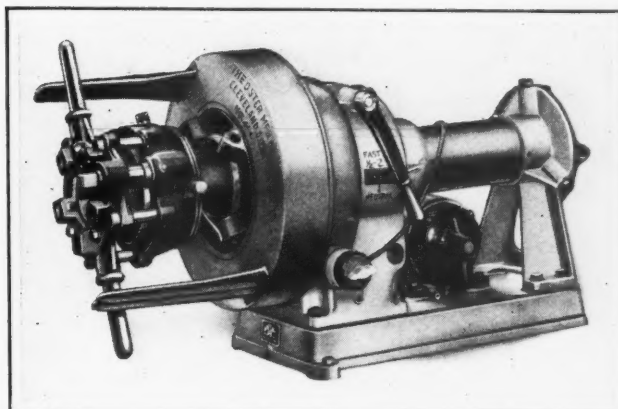
ment is advantageous when extreme accuracy is required in the duplication of forms, especially when made of high-speed steel.

Floating work-arbors hold the work in position between centers, and a radius truing device and magnifying glass provide for accurately truing the grinding wheel to the correct form. A dial indicator mounted in a bracket secured to the bed permits accurate reading of the table movement, as the point on the indicator engages with a stop secured to the sliding table dog rack.

A scale to the right of the cross-feed handwheel is designed to give an accurate vernier reading on long work beyond the capacity of the dial indicator. The vernier is secured to the sliding table. Fine angular adjustments of the upright are facilitated by a vernier located on the cross-feed carriage at the rear of the machine. When grinding to angles, the swivel table vernier provides for additional adjustments.

OSTER PORTABLE PIPE-THREADER

A portable pipe-threader known as the "No. 414 Oster Power Boy" has recently been placed on the market by the Oster Mfg. Co., Cleveland, Ohio. This machine is built mainly of aluminum alloy, and weighs only 380 pounds. Power is furnished



Oster Portable Pipe-threader

by a 1/2-horsepower universal motor, which will operate on a 110- or 115-volt lighting circuit of either direct or alternating current. Although the motor is of a variable-speed type which automatically speeds up with smaller pieces of pipe and holds the required speed on larger sizes, a two-speed transmission is also used. A handy gear-shift lever on one side of the machine is employed to change speeds.

The machine will handle all sizes of pipe from 1/2 inch to 4 inches through its barrel, and will drive geared die-stocks from 4 1/2 to 12 inches by means of an auxiliary drive shaft. Any square-end or roller-type pipe cutter of 2-inch capacity can also be driven. The pipe is held stationary in a three-jaw self-centering chuck, and the pipe tools are turned by the driving arms. Self-centering universal guides at the rear of the machine assist the front chuck in centering long lengths of pipe. The machine is 47 inches long, 20 inches wide, and 24 3/4 inches high.

DEMCO DRILLING MACHINE VISE

To facilitate the handling of regular and irregular shaped work under a drilling machine, Demco, Inc., 105-115 S. Calvert St., Baltimore, Md., has



Drilling Work Held in a Demco Vise

recently brought out the four-point vise here illustrated. This vise is milled on all four sides and has parallel ledges in the jaws. The vise holds work at all times with three points of support, in many cases with four points, and with a minimum amount of pressure, so that the piece to be drilled or tapped is not distorted. The supporting rods prevent sagging. Work can be held vertically or horizontally.

The cross-rods are in the same plane as the jaw ledges, and are easily removed. The screw is 1 1/2 inches below the jaw ledges, and the guide rods 1 1/4 inches below, thus preventing injury from the drill point. As the vise has no base, there is no chance for chips to clog. The vise is made in two sizes, a No. 4 with a 4-inch jaw and 4 inches of opening, and a No. 8, with an 8-inch jaw and 8 inches of opening.

DEFIANCE DOUBLE-SPINDLE SHAPING MACHINE

A No. 723 vertical double-spindle machine has recently been built by the Defiance Machine Works, Defiance, Ohio, for use in metal-working plants manufacturing hammers, hatchets, and similar tools. It is intended for tapering and reshaping the handles of these tools after they have been turned and dried, so as to make them uniform in size and shape before driving them into the heads of the tools.

A carriage slides on top of the machine table and supports a main form which has adjustable tracks on each side, giving a capacity to shape material up to 12 inches long, with a maximum taper of 1/2 inch on each side. Stock can be shaped straight or with irregular edges, the shape depending upon the contour of the tracks. Stock up to 3 inches thick and from 1 to 3 1/2 inches wide can be ac-



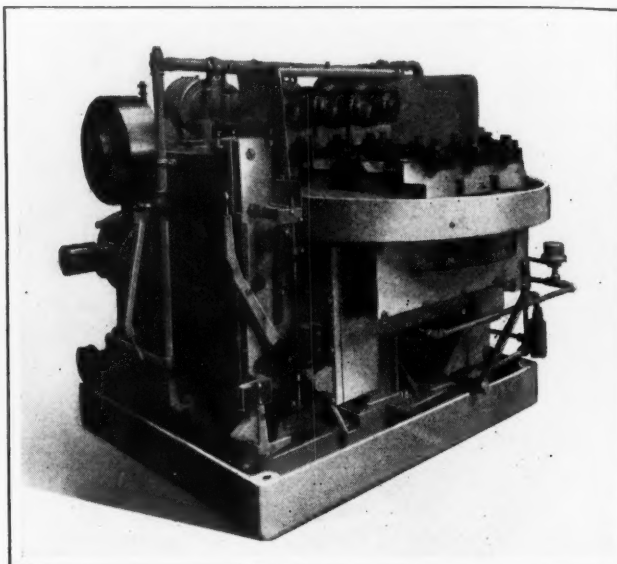
Defiance Double-spindle Shaping Machine

commodated. Square steel cutter-heads are employed, these heads being equipped with four knives having chip breakers. The machine weighs approximately 1100 pounds.

NEWTON CONNECTING-ROD MILLING MACHINE

An improved "rise-and-fall" milling machine has recently been built by the Newton Works of the Consolidated Machine Tool Corporation, Rochester,

N. Y., for slitting the caps and milling the bolt bosses of automobile connecting-rods. It is stated that with the new machine an increase in production of approximately 40 per cent is obtainable over previous machines of this type. The spindles are now provided with Timken bearings, and the four heads are separately adjustable horizontally for varying the center distances. The table gibs are located in line with the cutters and also in line with the center of gravity of the table, this con-



Newton Machine for Slitting and Milling Connecting-rods

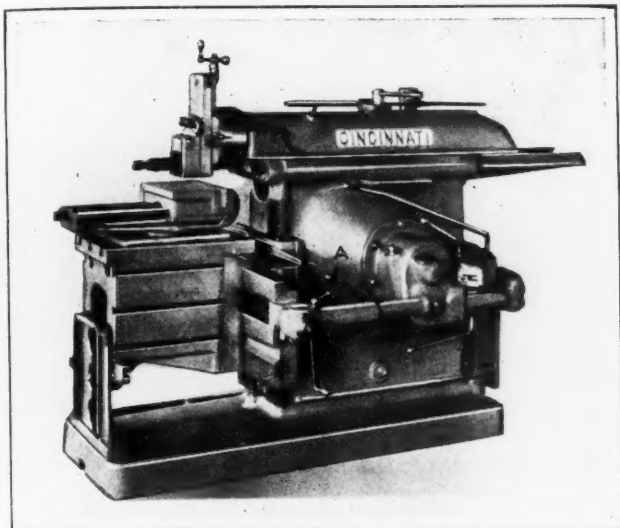
struction giving smoother feeding action and greater rigidity. The gibs are protected from cutter coolant and chips, the latter passing through the base to a pan at the back, from which they can be readily removed.

A vertical Oilgear feed and quick movement are provided for the table. The rate of feed is quickly adjustable by means of a screw on the oil-pump. The quick movement is much faster than on previous machines, and the length of this movement may be varied by adjustable dogs on the side of the knee. This arrangement provides for quickly setting up the machine to suit different sizes of connecting-rods, the only mechanical change necessary being that of adapting the fixture to suit the rods.

A power index, controlled through a hand-lever, eliminates manual operation of the table. Two sets of three fixtures are provided, the sets being located 180 degrees apart so as to enable the operator to load one set while milling is being performed on work held in the other. The table is locked in either of the two positions by means of a heavy tapered pin, which is held in a tapered bushing by a spring. This plunger is connected to a hand-lever, so that the operator can disengage the plunger during the power traverse of the table. A pin on the hand-lever interlocks with a plate on the machine in such a manner as to prevent any possibility of pulling out the index-pin during milling. Provision is made for supplying adequate lubrication to all the bearings on the machine.

CINCINNATI RAPID-TRAVERSE SHAPERS

Power rapid traverse to the table is now standard equipment on shapers built by the Cincinnati Shaper Co., Elam St. and Garrard Ave., Cincinnati, Ohio. The advantages claimed are speed of operation and less effort on the part of the operator. The power rapid traverse instantly shifts the table to the right position for the next job and quickly moves the work up to the tool for the cut. After one cut has been taken across the job, the table can be immediately shifted back for the sec-



Cincinnati Rapid-traverse Shaper

ond cut. The power rapid traverse is controlled by lever A, the direction of the movement being determined by the small feed engagement lever, in the same way that the direction of the feed itself is controlled.

The power rapid traverse is an integral part of the shaper mechanism. It is operated from the drive pulley, and can be actuated at any time, whether or not the ram is running. It is driven by the regular feed friction shaft, which acts as a safeguard against damage in case the work should be run to the extreme end of the rail or against the tool. The new mechanism involves no additional oiling, as it is included in the automatic oiling system of the entire machine.

A new and convenient ratchet crank has been added to the end of the cross-feed screw. This crank is idle during the rapid traverse, but it is always ready for use in hand-feeding. The power rapid traverse is applied to all sizes of Cincinnati shapers from the 16- to the 36-inch stroke, both of the universal and regular types.

Several other changes have also been made in Cincinnati shapers, the length of the ram bearing having been increased on all sizes. At the same time, the overhang of the tool in front of the ram bearing has been reduced by about 2 inches. A guard has been added at the rear of the shaper to completely protect the ram bearings from dust and grit and to prevent anyone from being hit by the ram on its return stroke. The single-screw vise is now furnished with a flat top, accurately ground, for use with an indicator or gage. A clamp-screw

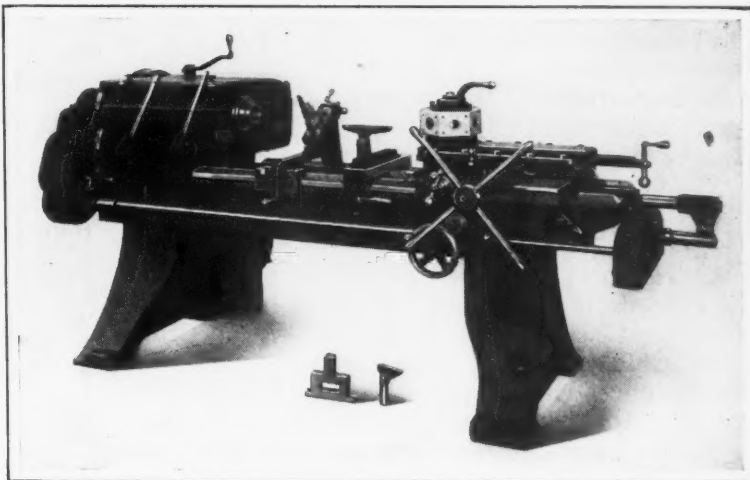
has been added for the tool-slide. Other details in the design of the shaper are the same as described in December, 1923, MACHINERY.

ACME BRASS TURRET LATHE

A new 20-inch full universal turret lathe designed to meet the demands of shops machining a variety of parts made of brass or similar metals has recently been brought out by the Acme Machine Tool Co., Cincinnati, Ohio. This machine accommodates a larger range of work than the previous model. The head is cast solid with the bed to insure rigidity and permanent alignment. It is regularly furnished with a three-step cone and friction back-gears which provide two speeds for each cone step. A single pulley drive can also be supplied, together with a patented quick-change all-gear head which gives twelve speed changes, both forward and reverse.

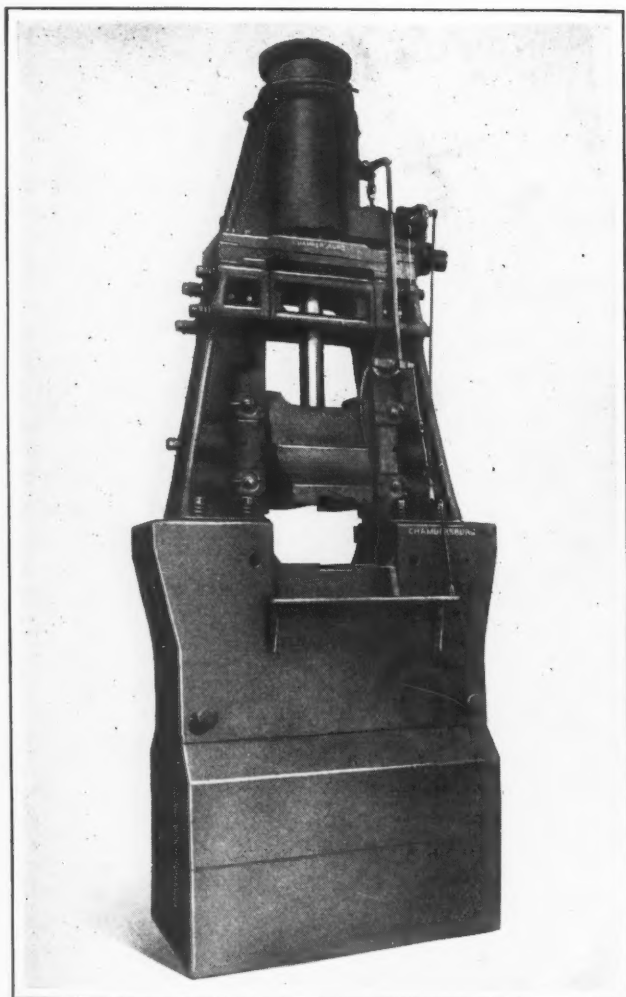
The turret is hexagonal in form, and is equipped with a quick-acting lever, which operates the lock-bolt and binds the turret. The slide on which the turret is mounted may be quickly fed to and from the work by hand through the turnstile, or slowly by turning the ball-crank lever at the end of the slide. A cross movement of the turret is also provided. Attention is called by the manufacturer to the large bearing area and long narrow dovetailed guide of the cross-slide.

To insure permanent alignment, the flat ways on which the cross-slide saddle was formerly mounted have been replaced by the vee type. The entire carriage may be traversed along the vees by hand or by power for the full length of the bed. This construction makes possible the use of long piloted boring-bars, permits rigid and quick set-ups, and reduces the turret overhang to a minimum.



Acme Brass Turret Lathe of Improved Design

Another particular feature is the taper attachment for the turret. An adjustable taper guide, such as is shown below the bed, slides between the vees, and can be clamped in any position or removed when not in use. Tapers can be turned with either the hand or power feed. A bed-type chasing attachment is regularly furnished for chasing both straight and taper right- or left-hand threads, one lead and follower being required for each size of thread. An apron-type chasing attachment can also be furnished for the turret carriage for lead-



Chambersburg Steam Drop-hammer

ing taps and dies and chasing internal or external right- or left-hand threads. This attachment can be used in conjunction with the taper attachment for chasing taper threads, and the same leaders and followers are used with this attachment as those employed with the bed-type attachment. The apron is machined to permit the application of the chasing attachment at any time.

CHAMBERSBURG STEAM DROP-HAMMER

A steam drop-hammer weighing 536,000 pounds has recently been built by the Chambersburg Engineering Co., Chambersburg, Pa., for the Crane Co., of Chicago, Ill. This hammer will be used for drop-forging valve bodies designed for high-pressure steam duty. It is believed by the builder to be the largest steam drop-hammer ever constructed.

The over-all height of the hammer is 32 feet 6 inches, and the timber and concrete foundation built to receive it is 16 feet deep. With 100 pounds of mean effective pressure, the energy in the ram at the instant of impact on the full stroke is estimated to be 428,000 foot-pounds. The rated size of the hammer, without the top die, is 22,000 pounds, and the estimated weight of the top die is 7000 pounds, so that the total falling weight is 29,000 pounds.

To facilitate handling and transportation, the anvil, which weighs 440,000 pounds, is made in three pieces. The cylinder has a bore of 30 inches,

and the piston a stroke of 52 inches. The distance between the guides is 46 inches, while the ram measures 48 inches from front to back. The piston-rod is 11 inches in diameter.

The frames are of I-beam construction and are tied into the anvil with positive stops and compound wearing wedges. The tops of the frames are fastened together with an interlocking tie-plate and double tie-bars. The guides are made of steel, with four vees, and are of universal adjustable type, which permits ready adjustment without shutting down the hammer. The guides may be moved back into the frames to permit removal of the ram in any position without disturbing the frames or the cylinder assembly, and the ram may also be removed without taking the rod from it.

The cylinder is locked into the tie-plate on its base, and is fitted with a balanced piston-type operating valve. It is also equipped with a Chambersburg patented safety cover. The piston-rings may be replaced or inspected without removing the rod from the ram. The cam mechanism is of one-piece construction, the cam bearing on a solid face machined on the ram.

HALLOWELL STEEL TRUCKS

Steel trucks of tilting, non-tilting, and wagon types are now manufactured in a wide range of styles and sizes by the Standard Pressed Steel Co., Box 20, Jenkintown, Pa. These Hollowell trucks have a top or platform made of a heavy steel plate, which has a deep integral flanged rib running around all four sides to provide a stiff section. The corners are welded, and pressed-steel brackets are also welded to the under side of the platform to hold the axle. Swivel casters are bolted to pressed-steel bases and welded in place. An anti-friction thrust bearing of large diameter is provided in each caster housing. In each corner of the platform there are six square holes, three on each side, which receive bolts for fastening corner fixtures.

Interchangeability has received special attention, and it is therefore an easy matter to change a truck with wooden stakes into one with slatted steel racks, bar handles, or plain steel stakes. Combinations of these can be had when desired, because all kinds of fixtures suitable to accommodate stakes, racks, or handles fit the corners of all platforms without requiring changes.



Fig. 1. Hollowell Steel Truck of Non-tilting Type



Fig. 2. Steel Wagon Truck with a Fifth-wheel Bolster

The running gear of the truck shown in Fig. 1 comprises four semi-steel wheels, the two larger wheels being mounted on a fixed axle, while the other two are swivel steel casters. Fig. 2 shows a four-wheeled wagon truck. The two rear wheels of this truck run on a rigid axle, while the two front wheels are mounted on a steel bolster. This bolster has a fifth wheel, 4 inches in diameter. The bolster is built up of steel throughout. This wagon truck is manipulated by means of a T-handled pull-bar, fastened to the bolster.

HYATT RAILROAD JOURNAL-BOX BEARINGS

Roller bearings are being more and more adopted for railroad service. On the Chicago, Milwaukee & St. Paul Railway a twelve-wheel coach equipped with roller bearings manufactured by the Hyatt Roller Bearing Co., Newark, N. J., has run over 325,000 miles without requiring attention to the bearings. A railroad journal box designed for the application of Hyatt roller bearings is shown in the accompanying illustration.

In this journal box all likelihood of oil leakage is removed by a system of grease grooves just back of a baffle wall. This wall catches any oil passing through the bearing and diverts it to an annular groove which carries it back to the oil reservoir at the bottom of the box.

The box lid is separate from the spacer casting which holds the axle block in place. With this construction, there is assurance that the lateral play of the axle will bring the axle end square against the block. This axle block is a floating element held against ro-

tation by its square section, and secured laterally by the method of locking indicated. Trucks using this box are set up with a predetermined amount of lateral movement of the axle. Shims interposed between the axle block and the cover lid permit precise adjustment of the lateral movement.

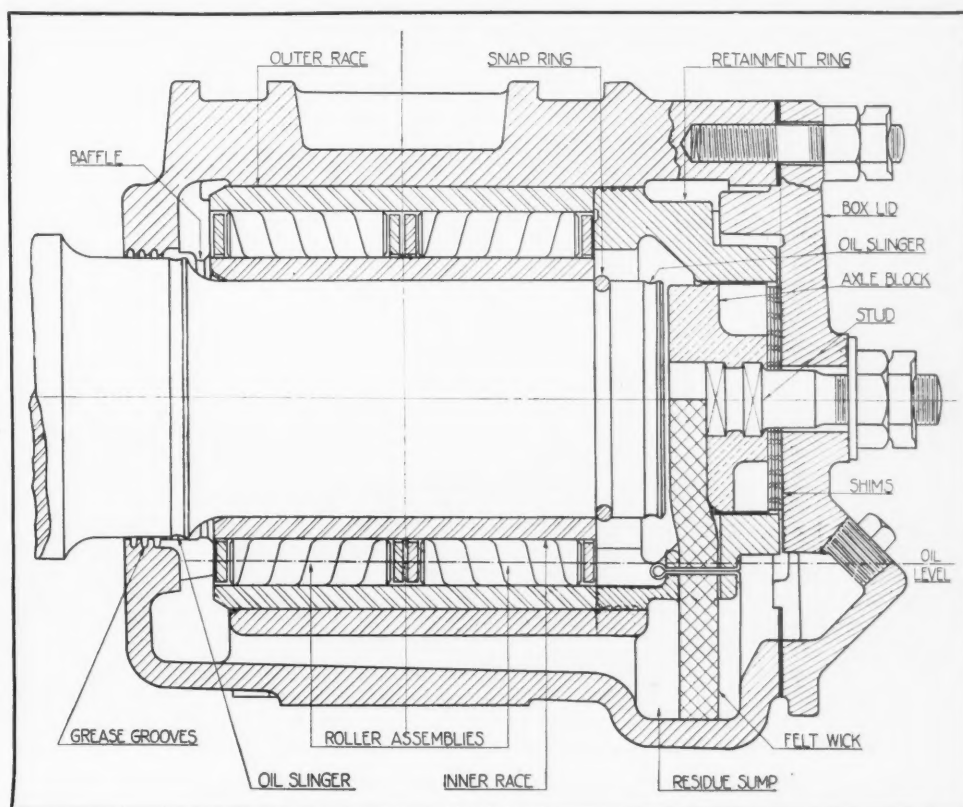
Adjustment of the blocks to compensate for wear should be necessary only when a car requires heavy repairs, although the lateral play may be checked by loosening the two nuts, pushing the block in and out, and measuring the movement. Inspection of the oil level, it is believed, will be required only about once every 5000 miles.

BADGER GRINDER WITH LONG TABLE

The No. 224 double-spindle grinder built by the Badger Tool Co., Beloit, Wis., and previously described in *MACHINERY*, has recently been made with an extra long table to carry the work in and out between the two parallel grinding wheels. This table or platen is mounted on fourteen roller bearing rolls and four side rolls, all of which are completely encased and protected against the entrance of grit. They are mounted on eccentric studs, so that alignment can be easily maintained.

The table is driven by a separate five-horsepower motor through gears, a clutch, a bull gear, and a rack. The speed of the table is 15 feet per minute, but by the use of change-gears, different speeds up to 25 feet per minute can be obtained. The length of the table over-all, without aprons, is 11 feet, and the width, 18 inches. The table has a travel of 72 inches.

The work for which this machine was primarily designed is a cast-iron boiler section measuring approximately 48 inches long by 17 inches high by 4 inches wide. A 1/4- by 1/4-inch rib runs entirely around the edges of this casting on both sides, and



Railroad Journal Box Equipped with Hyatt Roller Bearings

it is necessary to face off these ribs parallel and to size. The piece is quickly clamped in the fixture shown, and by operating the control levers, it passes between the grinding wheels, which automatically feed up to independent micrometer stop-screws. The production is twenty-five pieces complete per hour.

As on the regular machine, the main spindles are mounted in both radial and thrust ball bearings, and are provided with "Alemite" lubrication. Each spindle is connected to a 20-horsepower motor through a flexible sliding coupling having 2 inches of lateral travel. The entire machine, with the exception of the spindles, is lubricated by the Bowen "one-shot" system. The cylinder wheels are 24 inches in diameter, and the maximum opening between wheels is 24 inches. The complete weight of this machine is 23,000 pounds. A No. 224 grinder, hydraulically operated by means of an Oil-gear unit, was described in May MACHINERY.

SURFACE AND WAY GRINDING MACHINES

Two new machines, a vertical-spindle surface grinder and a rail-type way grinder, are being placed on the market by L. Sichel, 200 Fifth Ave., New York City. From Fig. 1 it will be observed that the surface grinder consists essentially of a bed, table, upright, and direct motor-driven grinding head which is mounted on a slide. All these members are assembled on a common foundation plate, which is provided with means for aligning the bed in both the vertical and horizontal planes. The machine is built in various lengths, widths, and grinding heights, the greatest width covered by the segment wheel-head being 25 inches.

The table is of a length that eliminates overhang; thus the entire load is given complete support at the extreme ends of the table stroke. The table can be reciprocated at various speeds, and its

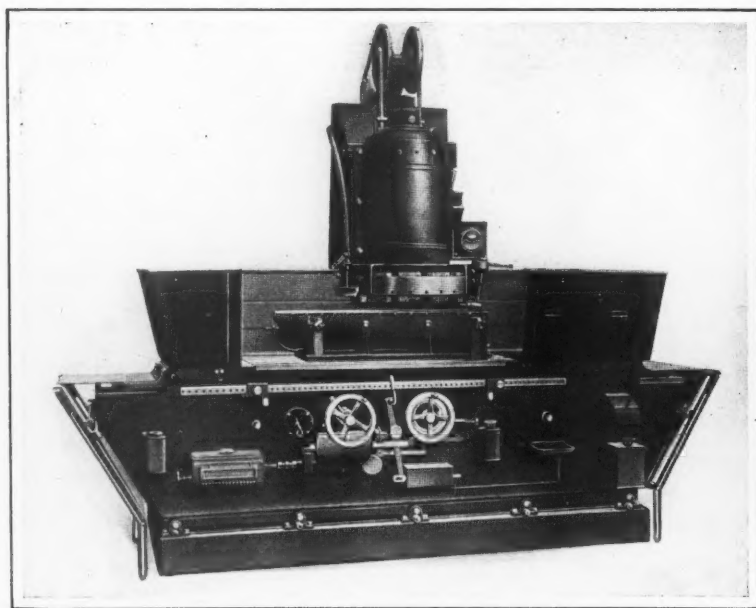


Fig. 1. Surface Grinding Machine Placed on the Market by L. Sichel

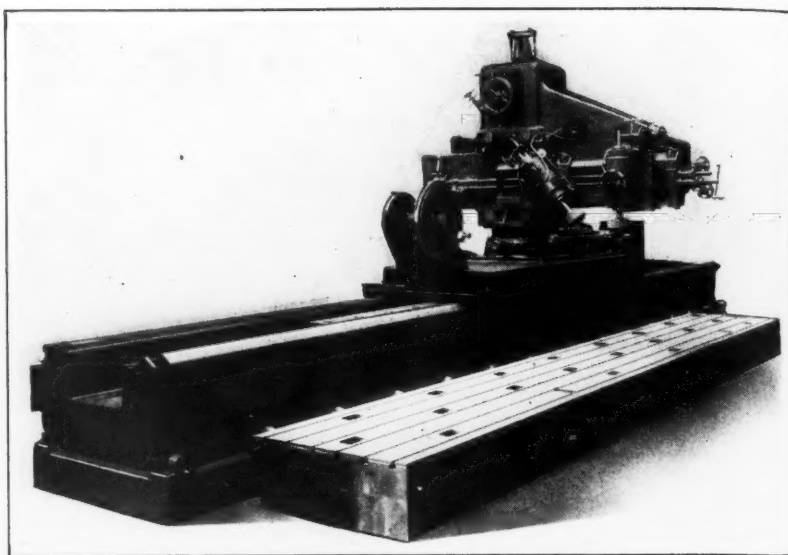


Fig. 2. Traversing-head Machine for Grinding the Ways of Lathe Beds, etc.

stroke adjusted for different lengths. It can also be traversed by hand and started or stopped by a push-button control. Table reversal is effected by means of a magnetic clutch.

The motor-driven grinding head can be elevated by hand or power and fed toward the work by power at various rates. The head is equipped with ball bearings and roller bearings for the combined armature and grinding spindle. The head may be tilted from the horizontal position for grinding concave surfaces.

Automatic lubrication is provided for, as well as wet grinding. The bed ways are protected by a cover, which automatically unfolds and rolls up with the action of the table. Three motors are furnished with the machine, one for the grinding wheel, one for the table, and one for the pump.

The way grinder (Fig. 2) is of the traversing head type shown diagrammatically on page 759 of June MACHINERY. On this machine, the work is stationary and the grinding heads are traversed along the work. The grinding heads are mounted on a double radial arm, which slides vertically on a rectangular column. This unit may also be swiveled around a full circle. The radial arm can be elevated either by hand or power and fed toward the work by a micrometer screw. A self-acting hydraulic device so counterbalances the arm that feeds of less than 0.0001 inch may be obtained and the arm can be adjusted vertically without effort.

One end of the radial arm is furnished with two independent grinding heads driven by 1 1/4-horsepower built-in motors. Cup or saucer wheels can be mounted on either spindle end of these heads. The heads are assembled on a compound slide, and may be adjusted along the rail, vertically and around a full circle. In order to duplicate work conveniently, both heads are furnished with a number of sensitive spirit levels, which may be accurately set to the desired angles.

These universal heads accommodate wheels up to about 10 inches in diameter for grinding narrow flats, vees, dovetails,

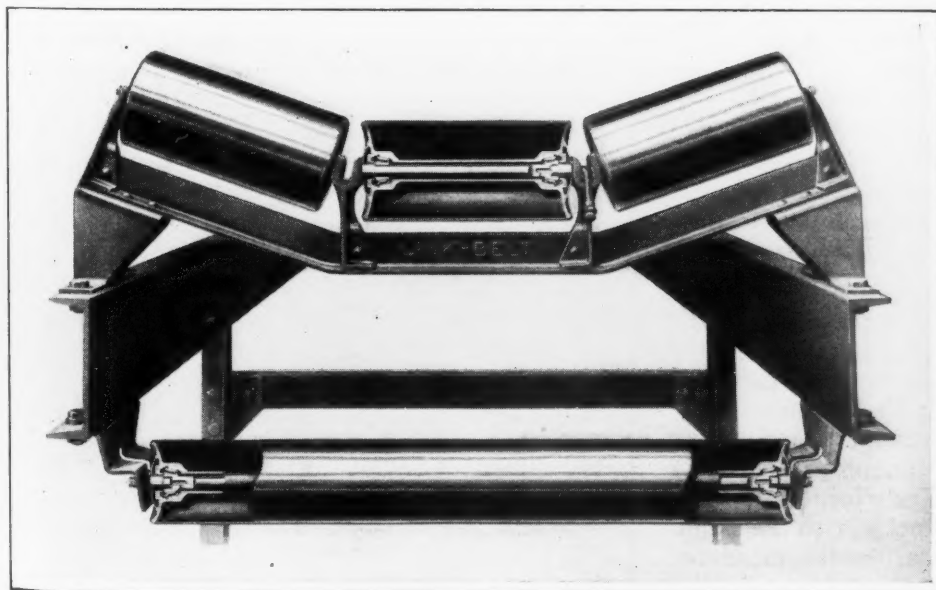
etc. For grinding wide flat surfaces, like those on the saddles, slides, rails, etc., of machine tools, a segment wheel-head is furnished on the other end of the radial arm. When swung into the working position, this head will finish surfaces parallel with those finished by means of the smaller universal heads. The radial arm column is reciprocated along the bed of the grinding machine in an operation, the bed length being made to suit requirements. Reversal of the column is obtained through a magnetic clutch.

LINK-BELT ANTI-FRICTION IDLERS

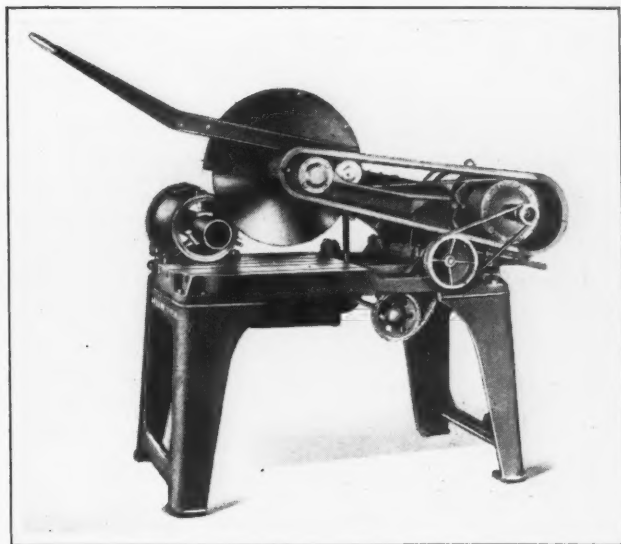
Belt-conveyor idler and return rolls equipped with Timken tapered roller bearings are being introduced on the market by the Link-Belt Co., 910 S. Michigan Ave., Chicago, Ill. These bearings are encased within the roll hubs, and each bearing is protected by a labyrinth grease seal. The seal is mounted in a grease cup, which also serves as an outboard reservoir, and lubricates the bearing on the outside as well as on the inside, especially when the roll is on an incline. A plate deflects dirt or any other foreign material away from the bearing and grease seal, and prevents the grease from being washed away from the labyrinth.

Troughing rolls or idlers are mounted on a self-cleaning T-base, and they are interchangeable, being capable of service in any of the three positions shown in the illustration. A return idler is seen near the bottom of the illustration. The entire frame is riveted, and there are no bolts or nuts to work loose or get out of adjustment. The rolls are supported in malleable-iron brackets which are so constructed as to support the ends of two adjacent rolls, thus insuring correct alignment.

Each roll shell is finished to obtain uniform thickness of the wall into which the machined heads are pressed and held in place by spinning. The heads are dished for rigidity and strength. The metal used for the roll shells varies with the material which the conveyor is to handle. These idlers are made in various standard lengths, and are furnished in combinations to suit standard belt widths.



Link-Belt Troughing and Return Idlers with Tapered Roller Bearings



Rotating Device Used in Cutting Pipe with a Hunter Saw

HUNTER PIPE ROTATING DEVICE

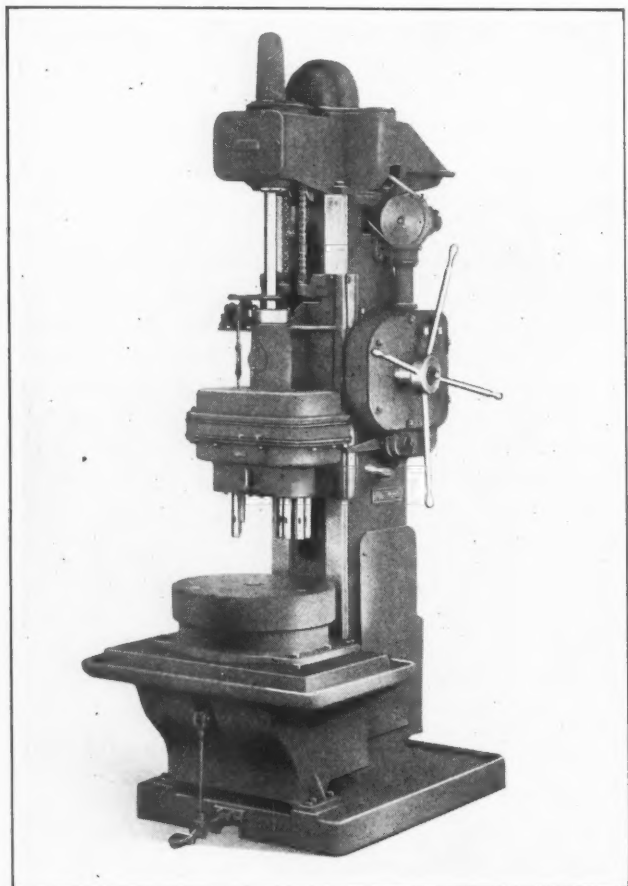
A device has recently been designed by the Hunter Saw & Machine Co., 5662 Butler St., Pittsburgh, Pa., for rotating pipe up to 8 inches diameter while cutting it on the No. 1-B high-speed metal cut-off saw built by this company. This rotating device, which is here illustrated, is driven from the pulley on the motor that drives the saw. There is a clutch on the left-hand side of the machine which controls the rotating device. As the saw is pulled down, the clutch is thrown in to start the pipe rotating. The machine is driven by a 10-H.P. motor.

"FOOTBURT" MULTIPLE-SPINDLE DRILL

Many shops have work that can be drilled on single-purpose multiple-spindle machines, but production is not large enough on any individual job to warrant the purchase of a special machine. Other shops have frequent changes in the design of work on which production is high, and thus do not care to purchase a complete machine each time a change is made. To meet these conditions, the No. 15 1/2-F multiple-spindle drilling machine built by the Foote-Burt Co., Cleveland, Ohio, is equipped with a flanged sliding unit to which different multiple heads may be bolted for various jobs. In changing from one job to another, it is merely necessary to change heads to adapt the machine for the new job, and this may be quickly done. Two dowels enter hardened steel bushings and locate the heads accurately on the slide. The machine shown in the illustration is arranged with a head having two groups of spindles, this head being merely one of many types that may be used.

With the exception of the flanged type slide, the machine is of the same design as the regular No. 15 1/2-F machine, and may be arranged for either motor or belt drive. All bearings in the drive are lubricated by the splash system, while lubrication for the heads is obtained by means of a small pump.

The circular table on the machine illustrated is of the three-position indexing type. Three fixtures are mounted on this table, and the front station is used for loading. The next station is used for drilling some of the holes in the work, and the third station for drilling the remainder. Other arrange-



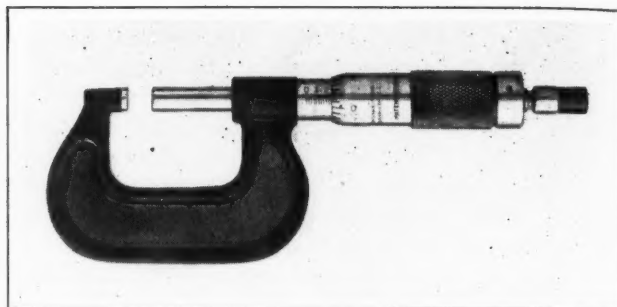
"Footburt" Machine with Interchangeable Heads

ments are possible, such as using the stations for loading, drilling, and reaming or counterboring.

The table is indexed by depressing the foot-pedal at the front of the machine, which withdraws a locating plunger from a bushing in the table and elevates the table 1/16 inch on a ball bearing. The entire weight of the table is carried on this bearing, making it easy to index, regardless of size. A vertically adjustable table can also be supplied.

BROWN & SHARPE MICROMETER CALIPER

Adjustment for wear of the measuring surfaces can be quickly effected by means of a patented feature on micrometer caliper No. 11 now being placed on the market by the Brown & Sharpe Mfg. Co., Providence, R. I. After an adjustment has been made, the parts are positively locked. Attention is also called by the manufacturer to the shape of the frame, which makes possible the measurement of many parts that could not otherwise be handled. The small size of the frame at the anvil



Brown & Sharpe Micrometer Caliper

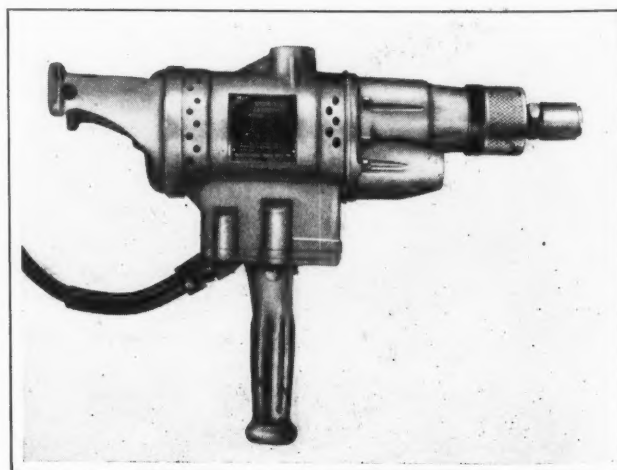
end adapts the micrometer for taking measurements in narrow slots, while the increased inside width of the frame makes it possible to accommodate odd-shaped pieces having projections and recesses. Measurements from 0 to 1 inch can be made in thousandths of an inch.

"THOR" INDUCTION-TYPE ELECTRIC TOOLS

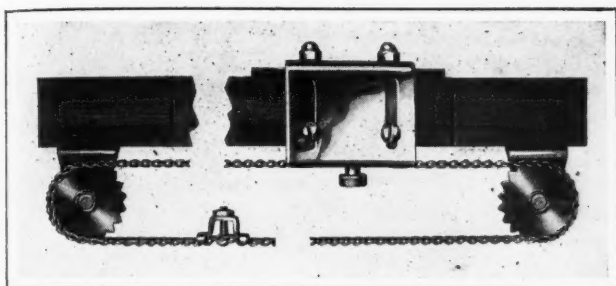
A new line of "Thor" high-frequency electric tools, equipped with squirrel-cage induction motors operating on 180-cycle current, is being placed on the market by the Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill. In these tools there are no armature windings, commutators, or brushes. Solid copper bars, riveted and welded in position, are used on the rotor. The stator case and the gear-case are made of aluminum.

One of the features claimed for this line of tools is a constant speed from no load to peak load. Another feature is the size and weight, it being stated that the weight of the various tools is about one-third that of a corresponding 60-cycle current tool. The tool illustrated is intended for drilling 7/8-inch holes and reaming 13/16-inch holes. It is also suitable for setting nuts up to and including 3/4 inch. This tool weighs only 24 pounds, and has a speed of 380 revolutions per minute.

To use high-frequency tools, it is necessary to install a frequency changer to step up the current. However, it is stated that the advantages are so great that any shop having ten or more portable tools in use will find it profitable and practical to do this. The new "Thor" line consists of drills, reamers, screwdrivers, tappers, nut setters, grinders, and sanders.



"Thor" 180-cycle Electric Tool



Pease All-metal Parallel Rule Attachment

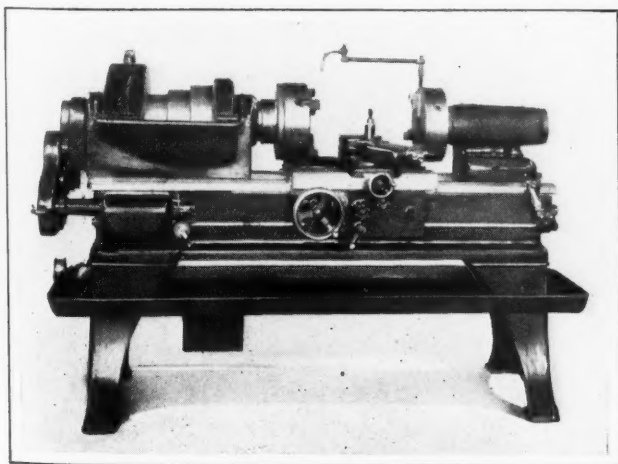
PEASE PARALLEL RULE ATTACHMENT

An all-metal parallel rule attachment of simplified construction has recently been developed by the C. F. Pease Co., 822 N. Franklin St., Chicago, Ill. It is intended for use with any drawing-board. In the illustration is shown one side of a drawing-board equipped with this attachment. The arrangement on the other side of the board is identical. A feature of the attachment is that the complete operating mechanism is beneath the table top and does not extend anywhere.

Four sprocket wheels connect a double chain drive, a revolving shaft extending between two of the wheels to maintain uniform operation. Sliding along the face of the board, one on each side, are two special clamps which are designed to hold any standard straghtedge. These clamps are always parallel to each other. Slack in the chains is taken up readily by means of two screw tension regulators. All parts are nickel-plated.

SPRINGFIELD SPECIAL LATHE

The special lathe here illustrated is designed primarily for use in the manufacture of broaches. This machine was built by the Springfield Machine Tool Co., 631 Southern Ave., Springfield, Ohio, and except for special features, is the same as the standard 16-inch lathe built by this company. A 3 5/8-inch hole extends through the headstock spindle, and there is a hole of the same size through the tailstock. The headstock spindle is, of course, much larger than on the standard machine, and the back-gear ratios have been increased to take care of the particular work for which the machine is intended. By means of the connected compound and plain rest furnished, forming tools can be used in conjunction with a finishing tool at the front.



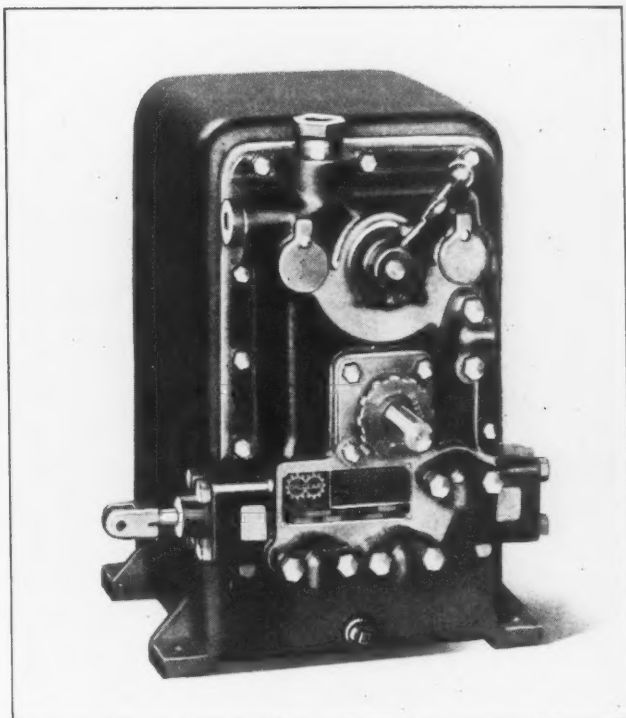
Springfield Lathe Used in Broach Manufacture

Attention is particularly called to the fact that this engine lathe is equipped with an oil-pan and pump, which is common equipment on turret lathes but not generally supplied on engine lathes.

OILGEAR HYDRAULIC PUMPS

Two new automatic variable-delivery pumps, types QS and QSA, are being introduced to the trade by the Oilgear Co., 660 Park St., Milwaukee, Wis. They are designed especially for providing milling, boring, drilling and similar machines with hydraulic feeds, being intended to meet the needs of the smaller sizes of these machine tools. Both pumps provide forward and reverse feeds and forward and reverse rapid traverse. The control is either by hand or automatically through a cam.

The control valve has positions corresponding to the following: Full speed forward (rapid ap-



Oilgear Automatic Variable-delivery Pump

proach), feed forward, neutral, feed reverse and full speed reverse (rapid return). When used with a 3 7/8-inch cylinder, each pump gives a feeding range of from 1.66 to 23 inches per minute forward. The QS pump gives a reverse feed of from 3.32 to 46 inches per minute, and a rapid traverse speed in either direction of 93 inches per minute. The QSA pump gives a reverse feed ranging from 2 to 27 inches per minute, and rapid traverse speeds of 46 inches per minute forward and 55 inches per minute reverse. Different sized cylinders give different operating speeds.

The maximum working pressure of each pump is 1000 pounds per square inch, and the power consumption at maximum capacity is 2 horsepower. The operating speed of the drive shaft is 860 revolutions per minute or lower.

CUTLER-HAMMER MOTOR STARTER

An across-the-line starter which is only about the size of a telephone box has been placed on the



Cutler-Hammer Small-size Starter

age protection. Push-buttons are provided in the front cover of the case.

The small size of this starter, in most cases, permits mounting it where the control station would ordinarily be placed, the extra wiring and cost of a push-button station thus being saved. However, one or more stations may be used if desired. To adapt the starter to any horsepower within the rating, it is only necessary to insert the proper sized heater coils in the thermal overload relay. This starter can be furnished to machinery builders without the case to be incorporated in machines as standard equipment.

UNION MOTOR-ON-ARBOR SAW

A saw bench driven by a motor mounted on the arbor has recently been brought out by the Gallmeyer & Livingston Co., 344 Straight Ave., S. W., Grand Rapids, Mich. This machine is suitable for pattern shop use. The motor regularly furnished is intended for operation from a lamp socket, but a one-horsepower motor operating from a power line can also be supplied for driving larger saws taking cuts up to 3 1/2 inches deep.

The machine has a 30- by 34-inch table, fitted with a removable throat plate to permit the use of a dado head, grooving saws, etc. The table tilts up



Portable Saw Bench with a Motor on the Arbor

market by the Cutler-Hammer Mfg. Co., 166 Twelfth St., Milwaukee, Wis. This product is intended for use with alternating-current motors of five horsepower and under. It gives a push-button control of starting and stopping, and provides thermal-overload protection and no-volt-

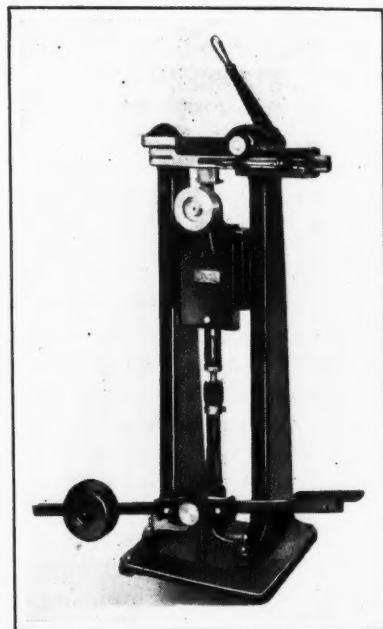
to 45 degrees, and may be locked at any desired setting. The cross-cut gage can be used on either side of the saw. It can be quickly set at any angle and clamped. Holes provide for mounting an auxiliary wood face piece. The ripping gage is machined on both sides, and can also be used on either side of the saw. The saw guard protects the operator at all times. It can be instantly set to allow any thickness of stock to be cut. A splitter guard keeps the stock from pinching the saw.

The pedestal is fitted with two rollers at the back and two stationary feet at the front which give a firm foundation when the saw is being used. By pulling the handle forward, a cam automatically raises the feet from the floor and brings the weight of the front of the machine on a third roller carried on a swivel bearing, making the machine portable.

NOBLE & WESTBROOK MARKING MACHINE

A machine designed for marking flanges near the outside edge of cups, rings, cooking utensils, etc., of large size, has recently been constructed by

the Noble & Westbrook Mfg. Co., Hartford, Conn. The machine is the standard No. 3 hand-operated marking machine of this company's manufacture, but in place of the regular table there has been substituted a special slide equipped with a special roll fixture, as illustrated. In marking rings and other large round articles, the machine has the advantage of being without a projecting table, which would limit



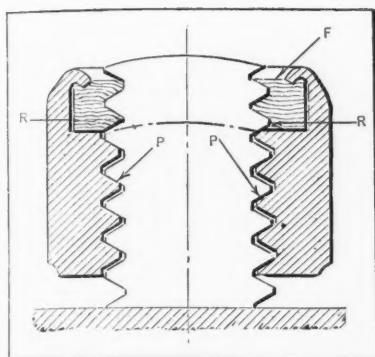
Marking Machine for Large Work

the size of the work. The work-holder is a part of the machine, and thus eliminates the extra work-holders ordinarily required.

Almost any size work up to 2 feet in diameter can be marked on the outside in a position near the edge. A flat die or steel type set in a holder is used to produce the marking. The machine is operated similarly to other machines built by the concern, the die being passed over the work through a forward motion obtained by means of a rack and pinion when the hand-lever is operated.

"ELASTIC STOP" SAFETY NUT

An "Elastic Stop" lock-nut which looks like a single ordinary nut, is now being manufactured by the American Gas Accumulator Co., 100 E. 42nd St., New York City. As may be seen from the illustration, this lock-nut contains an elastic cushion or disk *F*, made of hard vulcanized fiber, and this fiber is securely riveted within the nut. The hole in the



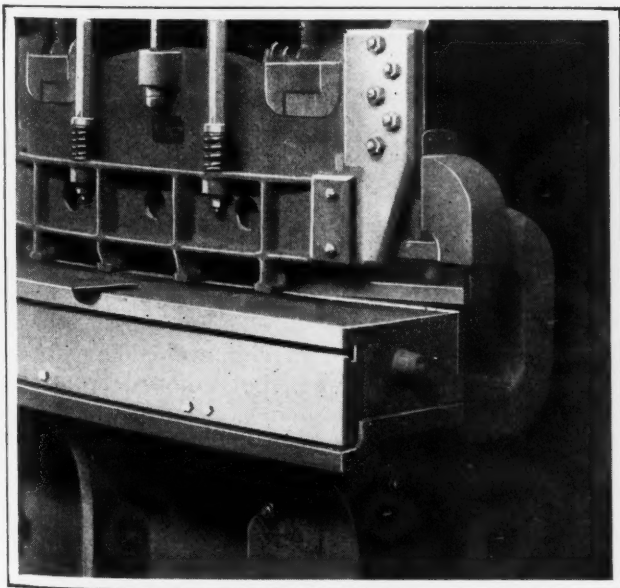
"Elastic Stop" Lock-nut

flanks *P* of the threads that sustain the pressure after the nut is drawn home against a support. This backward pressure is always maintained inside the nut, and forms a frictional resistance on the metallic flanks, which in itself is sufficient to keep the nut from turning. Since there is no play, the nut always fits tightly on the bolt, even though it is not drawn home, and by reason of the good fit, the nut cannot shake independently of the bolt.

In addition to the locking action produced by the friction between the metal surfaces, a radial locking action is obtained at points *R* due to the fiber cushion. When the bolt enters into the cushion, it impresses a thread which fits with a suction around the bolt, no chip being cut out. The cushion expands at the entrance of the bolt, and the thread generated in the fiber exerts considerable pressure around the bolt, which alone is sufficient to keep the nut from turning. When the bolt is withdrawn, the cushion returns to its original shape. The nut can be screwed on and off hundreds of times without impairing the locking effectiveness of the fiber.

LONG & ALLSTATTER SHEAR IMPROVEMENT

Cross-cutting and splitting operations can both be readily accomplished with gate and squaring shears built by the Long & Allstatter Co., Hamilton, Ohio, by virtue of a recent improvement. This improvement allows one end of the shear blades to remain open a little more than the thickness of the



Improvement on Long & Allstatter Shears

disk is somewhat smaller than the outside diameter of the bolt, and is not threaded.

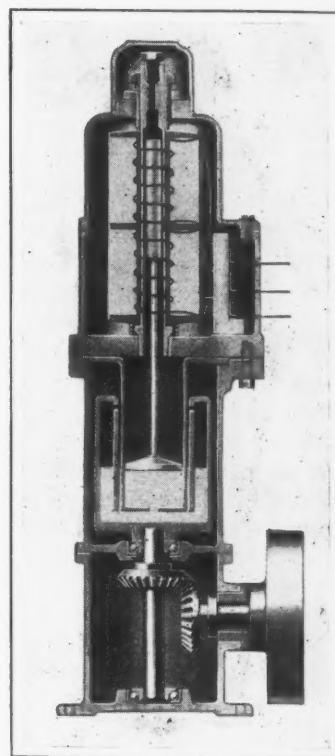
When the bolt enters the nut and meets resistance from the fiber cushion, contact between the metallic nut and the screw takes place on just those

material being sheared, which permits cutting into a sheet longer than the blades themselves without nicking or tearing the sheet. Sheets may be cross-cut the full width between the housings and split to any length. These operations can be performed alternately, if desired, without necessitating any change in the arrangement of the machine. The improvement is incorporated in the No. C and smaller size machines built by the company.

BROWN CENTRIFUGAL-TRANSMITTER TACHOMETER

An electric tachometer which is operated by the centrifugal transmitter shown in the accompanying illustration is the latest development of the Brown Instrument Co., Philadelphia, Pa.

This transmitter operates on the inductance bridge principle. When the mercury chamber is revolved, mercury is thrown into the outer chamber by centrifugal force. In consequence, the mercury level falls in the central chamber as it rises in the outer one. The float which rests on the mercury moves up and down with the rise and fall of the mercury level. An armature supported on the float moves in the field of a divided inductance coil, and a similar divided inductance coil in the indicator or recorder



Brown Centrifugal Transmitter

causes the pointer to assume a definite position relative to the level of the float on the mercury.

Various advantages are claimed for this method of measuring speed, it being pointed out that the commutators and brushes used in electric tachometer generators are eliminated. There is practically no friction, as the mercury freely rises and falls with an increase or decrease in speed and the instrument responds promptly to the slightest change in speed. The indicator has a large 12-inch dial, with a scale extending over 300 degrees of a circle. The instrument may be connected to any alternating-current 110-volt 60-cycle circuit or used on any other alternating-current circuit by the addition of a small transformer, which will give the correct voltage according to the frequency of the line. Speeds can be recorded, if desired, on various recording instruments, both of the single and multiple-record types.

ELWELL-PARKER "TRUCTOR"

A two-ton tiering "Tructor" has been added to the mill type series manufactured by the Elwell-

Parker Electric Co., Cleveland, Ohio. This machine is designed to handle skid loads in regular truck service or to elevate loads 4 to 8 feet from the floor, for tiering or stacking in storage rooms or for lifting parts to motor trucks, railroad cars, etc.



Elwell-Parker Two-ton Tier "Tractor"

The "Tractor" completes a line of this type, two previous sizes being rated 3 and 6 tons.

The power plant of this truck is of the unit type, with an enclosed motor which delivers power through various members to steel clutch plates bolted to the outside of the drive wheels. These wheels are fitted with solid rubber tires and Timken tapered roller bearings. There are two pedals for the operator, one of which controls the brake, and the other the controller reverse drum. The brake and drum are tripped into the "off" position when the corresponding pedal is raised as the operator leaves the truck.

The lift controller is located beneath the driving motor controller and is also of the drum type. The handle is lifted to elevate the load and reversed to lower it. An automatic tripping device returns the drum to the "off" position when the low platform reaches its highest or lowest position. It can also be returned manually at the will of the operator. Lifting is accomplished by means of an enclosed motor which drives through a spur gear reduction to double-grooved drums that carry a steel cable. The tension in this cable is automatically maintained by means of a special device provided for the purpose.

* * *

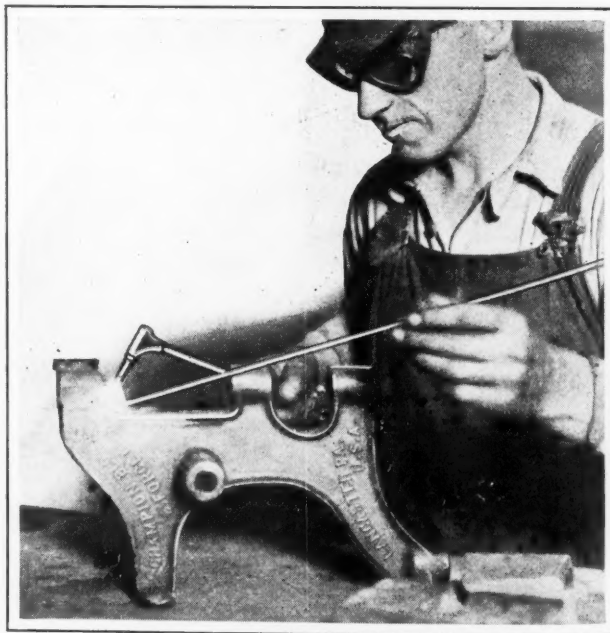
REPAIRING MALLEABLE IRON PARTS BY OXWELDING

Malleable iron parts, such as shaft hangers, supports, and pedestals are sometimes broken when subjected to unusual stresses or vibration. Often such breaks occur at the most inopportune times. By employing the following oxwelding methods, which were described in a recent issue of *Oxy-Acetylene Tips*, it is generally possible to repair the broken parts promptly and put them back into service. In repair work of this kind, there are several important things to be considered, first among which is the matter of exact alignment of all the parts. Careful and exact preparation by the operator, and the use of bronze-welding, makes this possible at a minimum cost.

The accompanying illustration shows a malleable iron pedestal for a blower shaft, on which the arm was broken. Bronze-welding is always employed for malleable iron, and the procedure for such material is about as follows: The break is first chamfered to a double vee on the grinder, and is then fitted in place. It is necessary in this case that the broken arm be in alignment with the other two members of the pedestal in order to have the shaft run true. A straight piece of cold-rolled bar stock of the same diameter as the shaft is fitted into the bearings to line up the members and hold the broken arm in its proper position. After this has been done, the arm is tack-welded with bronze at each end.

The part is next laid on its side, so that the welding can be done on a horizontal surface. One end of the vee is heated to a dark red color, employing the neutral flame and at the same time holding the end of the bronze rod in the outer envelope. When the metal reaches the desired heat, the rod is dipped in "Brazo" flux and inserted in the flame. A thin bronze film then spreads over the red-hot section under the melted flux, the same as the flux used in "tinning" preparatory to soldering.

The section over which the bronze film has spread is then filled up with bronze, care being taken not to burn the metal. Burnt bronze has a dirty white color, and should be avoided. After finishing this section, a similar procedure is followed in building up the adjacent sections. When one side is completed, the casting should be turned over and the other side of the break welded in the



Oxwelding Broken Malleable Iron Pedestal

same way. When the two side welds have been made, the aligning bar can be removed from the bearings.

After both sides have been filled up, each end is welded and all the bronze smoothed off with the flame. The casting should be cooled slowly. The rough surfaces can be smoothed by grinding or filing. There are many instances where bronze-welding of malleable iron will prove a convenient method of effecting repairs quickly.

THE LEIPZIG FAIR

The international trade fair which has been held for centuries at Leipzig, Germany, will reopen this year during the week beginning August 28. More than twenty countries will have exhibits, the total number of exhibits approximating 7000. This exposition is not a fair in the sense of a "world's fair," to which we have become accustomed in this country. There is no "midway" or amusement center. Visitors are admitted to the exhibition grounds and buildings by invitation only, thus eliminating mere sightseers. The spring fair this year attracted over 1500 visitors from the United States, and there were a great many American exhibits. Additional information relating to the fair may be obtained from the American office of the Leipzig Trade Fair, Inc., 630 Fifth Ave., New York City.

* * *

INDUSTRIAL MANAGEMENT CONFERENCE

The twelfth annual summer conference for industrial executives will be held under the joint auspices of the departments of Industrial Engineering and Engineering Extension of the Pennsylvania State College, from August 22 to September 3. The program will deal with those problems of organization that affect executives, from the foreman to the president. Costs, personnel problems, factory location and layout, time study, wage payment plans, industrial economics, and similar topics will be discussed. Those interested may obtain further information from Professor C. W. Beese, head of the Industrial Engineering Department, Pennsylvania State College, State College, Pa.

* * *

DIRECTORY OF LABORATORIES

In recognition of the desirability of independent commercial testing service and in anticipation of a marked increase in the demand for such service in both domestic and export trade, the National Bureau of Standards has compiled a list of laboratories throughout the country that are prepared to test various kinds of commodities to determine whether or not they comply with purchase specifications. This list is known as Miscellaneous Publication No. 90 of the Bureau of Standards, and can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 15 cents per copy.

* * *

HUMAN RELATIONS IN INDUSTRY

The tenth annual conference on human relations in industry will be held at Silver Bay, Lake George, N. Y., September 1 to 4. The secretary of the conference is Fred H. Rindge, Jr., 347 Madison Ave., New York City. Addresses will be presented on numerous subjects, including Industry and International Relations; The New Responsibilities of Modern Business; The Scientific Approach to Industrial Relations; Ideals for Medical Service in Industry; Improving Industrial Relationships on the Railroads; and Labor's Viewpoint on Cooperation.

* * *

STEEL AND RIVER TRANSPORTATION

An attractive book entitled "Our Runaway Rivers—Put Them to Work," containing sixty halftone illustrations with accompanying text relating to how our inland waterways, under control and regulation, can be made to serve commerce and industry to the material benefit of the whole nation, has been published by the Jones & Laughlin Steel Corporation, Pittsburgh, Pa. The book also contains a map showing how this company makes deliveries of steel by river and rail to different points in the United States.

* * *

A brief review of the growth of employee representation or works councils has been published by the Department of Manufactures, Chamber of Commerce of the United States, Washington, D. C. This report explains the various types of works councils in operation, and quotes the experiences of concerns that have established them, as well as the difficulties encountered in operating such systems.

TRADE NOTES

GLOBE MALLEABLE IRON & STEEL CO., Syracuse, N. Y., has changed its name to the GLOBE FORGE & FOUNDRIES, INC.

ALLEN-BRADLEY CO., 499 Clinton St., Milwaukee, Wis., announces that its Philadelphia office has moved to new quarters at 600 S. Delaware Ave., Philadelphia, Pa.

SACHS BEARINGS, INC., announce the opening of an office at 114 Liberty St., New York City, as United States and Canadian representatives of Fichtel & Sachs, A. G., Schweinfurt on-Main, Germany, manufacturers of ball and roller bearings, steel balls, and coaster brakes.

GODDARD & GODDARD CO., 4724 Hastings St., Detroit, Mich., manufacturer of milling cutters, has added another floor to the company's plant, the offices, engineering department, and lighter machine work being located on the upper floor, while the main machine shop is on the ground floor.

McKINNEY TOOL & MFG. CO., Cleveland, Ohio, designer and builder of special machinery, has moved from 15215 Utopia Ave., to its new shop at 1688 Arabella Road, Cleveland, which is a modern brick and steel construction throughout. The new quarters will afford the company a total floor space of 4000 square feet.

KENT MACHINE CO., manufacturer of automatic threading machinery, bolt pointers, semi-automatic drilling machines, etc., has moved its office and plant from Kent, Ohio, to Cuyahoga Falls, Ohio. As this concern also controls the Falls Clutch & Machinery Co., it was deemed advisable to consolidate the two plants in one location.

HUSKY WRENCH CO., Milwaukee, Wis., has added to its line of socket wrenches a set known as the No. 190 "Utility Set," packed in a black enameled metal box. This set, which contains complete socket and screwdriver outfits, is said to make possible the building up of over 600 wrench combinations and over 300 screwdriver combinations.

INGERSOLL-RAND CO., 11 Broadway, New York City, has opened a branch office at 236 High St., Newark, N. J., in order to provide better sales and service facilities for its customers in northern New Jersey and the adjacent counties in New York state. F. K. Armstrong, formerly connected with the company's New York sales branch, has been appointed manager of the new office.

BEARINGS CO. OF AMERICA, Lancaster, Pa., is enlarging its plant by the construction of three new buildings. One structure, 150 by 40 feet, and another, 100 by 94 feet, are being added to the Sterling plant group. A third building of reinforced concrete, 130 by 100 feet, is being added to the main plant. These additions will increase the production facilities of the company 50 per cent.

BETHEL-PLAYER CO., INC., Westboro, Mass., has taken over the assets of the BETHEL-PLAYER CO. The officers of the new concern are: Sydney Player, president and general manager; Joseph N. Bethel, vice-president and sales manager; Harold J. Rowe, treasurer; and Kenneth E. Summers, assistant treasurer. The company will continue to manufacture vertical lapping machines, measuring instruments, and special machinery.

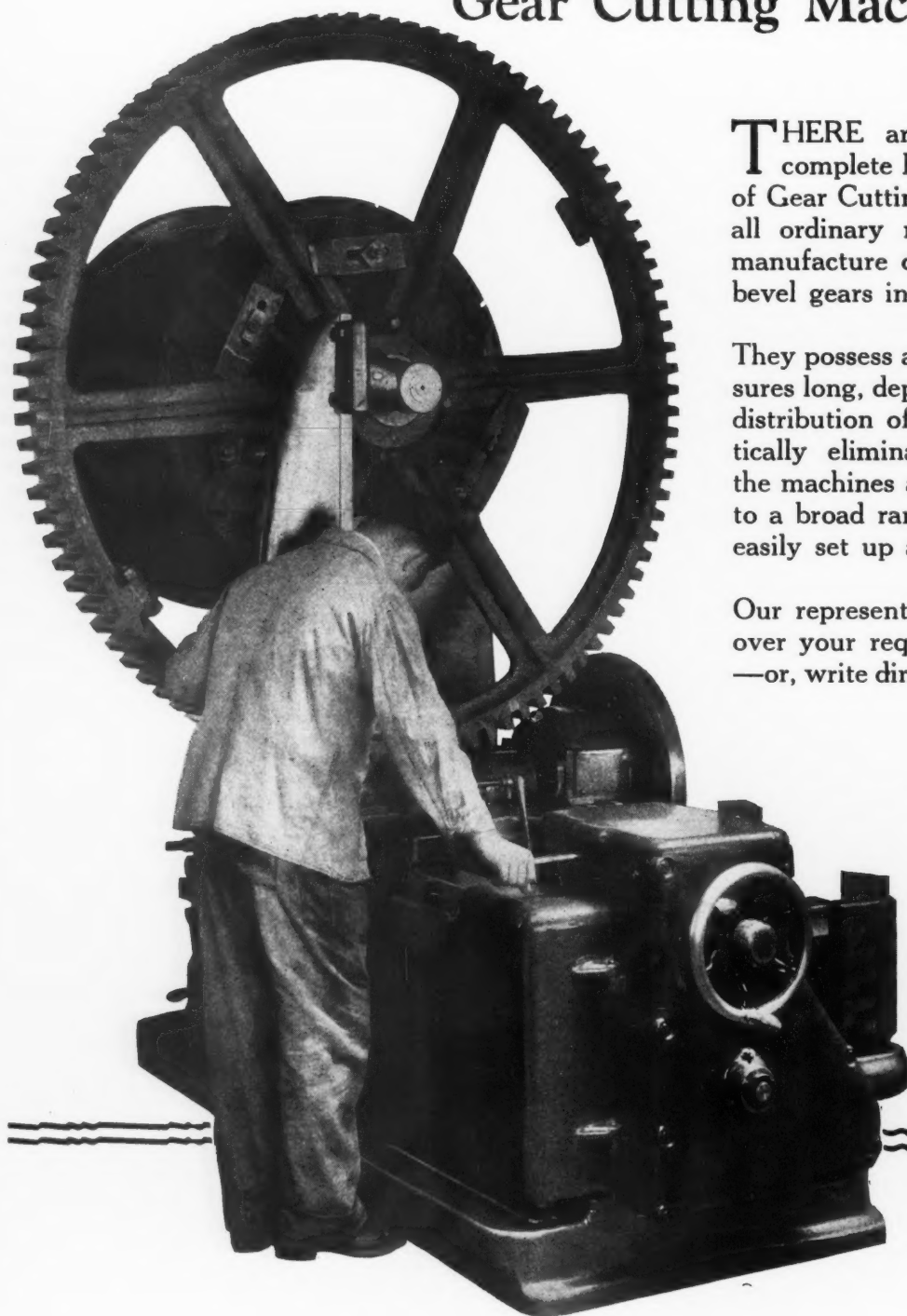
LAKEWOOD ENGINEERING CO., Cleveland, Ohio, has appointed the T. J. Lane Equipment Co., Springfield, Ohio, agent for its complete line in the central Ohio territory. The Mechanical Supplies Co., Cincinnati, Ohio, has been appointed agent for the Cincinnati territory and adjacent counties in Kentucky. The company announces that it is opening a construction machinery department, which will be carried on in addition to its regular supply business.

W. F. & JOHN BARNES CO., Rockford, Ill., is now represented in the Detroit district by the Cadillac Machinery Co., 6209 Hamilton Ave., Detroit, Mich., who will sell the complete line of machine tools manufactured by the company, including the standard open-frame drilling machines, which have been the product of the company for the last fifty years, the 20-inch production drill, and the Barnes complete line of horizontal duplex drilling and boring machines.

AIR REDUCTION CO., INC., 342 Madison Ave., New York City, has purchased the business, in so far as the manufacture and sale of oxygen, acetylene, and kindred products are concerned, of the United Gas Improvement Contracting Co., a subsidiary of the United Gas Improvement Co. and the United Oxygen Co., of Philadelphia, Pa. The purchase includes oxygen plants at Philadelphia, Chester, Milton, Enola, and Reading, Pa., and an acetylene plant at Bridgeport, Pa.

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insure the accuracy
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BROWN & SHARPE

BROWN & SHARPE MFG. CO.



PROVIDENCE, R. I., U. S. A.

WHITNEY METAL TOOL Co., Rockford, Ill., manufacturer of punches and shears, has purchased the three-story building known as the Walt Talcott Building which adjoins the company's present factory building No. 2. The new building is 60 by 120 feet, and with this acquisition, the company now has a 218-foot frontage, which increases the factory to about double the previous size. A new stock-room and office building have recently been completed, this expansion being required by the growing demand for the company's product.

WHITING CORPORATION, Harvey, Ill., has appointed the Eichman Machinery Co., 21 Manufacturers' Exchange Bldg., Kansas City, Mo., representative of the company in the state of Kansas and the western part of Missouri; the Huey & Philp Hardware Co. of Dallas, Tex., in the state of Oklahoma and Texas, with the exception of the southeastern part, which is handled by Brazelton, Wessendorff & Nelms of Houston, Tex.; L. H. Staley, Whitney-Central Bldg., New Orleans, La., in the state of Louisiana, southern half of Mississippi, and the city of Mobile, Ala.; and H. B. Wilson Co., St. Louis, Mo., in the state of Arkansas.

FOOTE BROS. GEAR & MACHINE Co., 240 N. Curtis St., Chicago, Ill., has completed arrangements to have the sales of IXL speed reducers and gear products in the northern half of the state of Oklahoma handled by the Circle Corporation, P. O. Box 1224, Tulsa, Okla. The Houston Armature Works, Houston, Tex., have been appointed local representatives in the vicinity of Houston. The Briggs-Shaffner Co., Winston-Salem, N. C., has been made district representative for the state of North Carolina. G. W. Craighead has been appointed district representative covering the eastern half of the state of Michigan, with headquarters at 4-230 General Motors Bldg., Detroit, Mich.

CONSOLIDATED CONCRETE MACHINERY CORPORATION, with headquarters at Adrian, Mich., has been formed by the consolidation of a number of companies manufacturing concrete and construction machinery, including the IDEAL CONCRETE MACHINERY Co. of Cincinnati, Ohio. The metal cleaning, washing, drying, and burnishing equipment end of the Ideal Concrete Machinery Co.'s business will continue to have its sales office in Cincinnati and will be conducted under the name of the IDEAL INDUSTRIAL MACHINERY DIVISION of the CONSOLIDATED CONCRETE MACHINERY CORPORATION. Nathan Ransohoff will continue as engineer in charge of production and installation.

CHAMBERSBURG ENGINEERING Co., Chambersburg, Pa., and the NATIONAL MACHINERY Co., Tiffin, Ohio, announce that, effective July 1, Chambersburg hammers and hydraulic machinery and National bolt and forging machinery will be marketed by a combined sales organization. The lines of the two companies do not conflict, but augment each other, and by this combination of sales organization, it will be possible to offer a complete line of forging equipment, as well as advice on any forging problem. Except for the amalgamation of the selling forces, the two companies will remain separate organizations, there being no change in ownership or management. Sales offices will be maintained in Chambersburg, Pa., Chicago, Ill., Detroit, Mich., New York City, and Tiffin, Ohio.

WILMARTH & MORMAN Co., Grand Rapids, Mich., announces that the company has become affiliated with the MACHINERY Co. of AMERICA, through a merger with several other companies, involving a total capitalization of approximately \$2,000,000. The Wilmarth & Morman Co. will continue to do business at its present location, and there will be no change in factory or sales personnel. The other units included in the merger, besides the Wilmarth & Morman Co., manufacturer of precision grinding machines, are COVEL MFG. Co. of Benton Harbor, Mich.; BALDWIN, TUTHILL & BOLTON Co., Grand Rapids, Mich.; and HANCHETT SWAGE WORKS, of Big Rapids, Mich. The headquarters of the Machinery Co. of America are at Big Rapids. The consolidation took place with a view to avoiding duplication in the design of new equipment by the member companies.

HYATT ROLLER BEARING Co., Newark, N. J., announces that, in response to requests from several manufacturers of products in which Hyatt roller bearings are installed, the company has produced a symbol known as the "Hyatt mark of bearing protection." This symbol shows a cross-section of the hollow Hyatt rollers in operating position around a shaft, and bears the legend "Equipped with Hyatt Roller Bearings" in white letters on a red background. The entire symbol is enclosed by a circular gold border. The manufac-

turers using Hyatt roller bearings transfer this mark to their product and in this way make the presence of the Hyatt bearings easily seen. Many manufacturers are now using this mark.

STROM STEEL BALL Co., whose plant at Oak Park, Ill., a suburb of Chicago, was almost completely destroyed by fire last March, is now occupying and operating a new plant located at 1842-1854 S. 54th Ave., Chicago, Ill., in the Cicero industrial district. The new plant consists of a modern one-story, steel-sash and skylight-roof construction factory building covering 41,000 square feet. It will permit an increase in the company's manufacturing capacity of about 75 per cent, 40 per cent of which has already been made available by means of new machinery and equipment. G. A. Strom, formerly a vice-president and secretary of the U. S. Ball Bearing Co. (later the Strom Ball Bearing Mfg. Co.), which concern was merged with another company about three years ago, is president and general manager; R. H. Coolidge is treasurer; and H. E. Johnson is secretary.

OBITUARY

A. V. HANNIFIN, secretary and treasurer of the Hannifin Mfg. Co., Chicago, Ill., maker of air-operated chucks and adjustable boring-bars, died July 4, following an operation for appendicitis. Mr. Hannifin was actively engaged as secretary and treasurer of the company for seventeen years, and was one of the pioneers in the air-operated chuck and fixture business. He had a thorough practical knowledge of this type of equipment and great confidence in its value and merit in the metal-working industries. Mr. Hannifin was a member of the American Society of Mechanical Engineers.

SIX MONTHS IN THE AUTOMOBILE INDUSTRY

While, on account of the comparatively low production of the Ford Motor Co., the total automobile production this year has been below that of last year, the National Automobile Chamber of Commerce announces that most companies in the automobile business have enjoyed a production record in the first six months of 1927 that has exceeded the same period a year ago. For those concerns that are members of the National Automobile Chamber of Commerce, the excess is nearly 10 per cent. The total output for these members, which does not include Ford production, is 1,744,040 for the first six months in 1927, compared with 1,590,448 for the same period in 1926.

* * *

TORONTO STEEL AND POWER SHOW

At the steel and power show to be held in the University of Toronto Arena, Toronto, Ontario, August 31 to September 2, six technical sessions covering subjects of wide variety will be held. Among the subjects to be dealt with are materials handling as a factor in production; the redesigning of present riveted and cast structures to adapt them to the use of arc welding and structural steel; burning coal in pulverized form; development in the last ten years from the physics-metallurgical viewpoint; properties of manganese steel; relative economy of electric and fuel-fired furnaces; recent developments and application of chromium irons and steels in the fields of corrosion and heat resistance; and high-temperature cement versus fire-clay.

* * *

THE WORLD'S MECHANICAL ENGINEERING INDUSTRY

Two volumes have been published from material prepared by the Economic and Financial Section of the League of Nations from information furnished by various governments and by industrial organizations, relating to the mechanical engineering industries of the world. The volumes are obtainable from the American agent for publications of the League of Nations, World Peace Foundation, 40 Mount Vernon St., Boston, Mass. Volume I is published at the price of \$1.50, and Volume II at \$0.75. The work contains comprehensive statistical tables and summaries from the most up-to-date available information.



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RYERSON MACHINERY

PERSONALS

D. D. KNOWLES, the twenty-eight-year old inventor of the grid-glow relay, has been awarded the John Scott Medal



D. D. Knowles

given annually in recognition of "useful inventions for the use and benefit of mankind." The award carries with it a cash prize of \$1000. Mr. Knowles perfected his invention in the research laboratories of the Westinghouse Electric & Mfg. Co., East Pittsburg, Pa. His grid-glow relay is considered the most sensitive current-controlling device ever developed. This glow tube, which functions on a billionth of a watt, is so sensitive that it is set in operation by such small impulses as the mere approach of the human hand, the falling of a drop of water, or the lighting of a match.

BURTON L. DELACK, assistant manager of the Schenectady Works of the General Electric Co. since December 1, 1926, has been appointed acting manager, to fill the position made vacant by the promotion of C. E. EVELETH, who was elected a vice-president on June 1. EDWARD A. WAGNER, formerly of the Fort Wayne Works, but since July, 1926, managing engineer in charge of all distribution transformers, with headquarters in Pittsfield, has been made acting manager of the Pittsfield Works, succeeding C. C. CHESNEY, who has been a vice-president in charge of manufacturing since the retirement of F. C. PRATT. GIUSEPPE FACCIOLI, works engineer of the Pittsfield Works, has been appointed associate manager and works engineer of the Pittsfield Works.

L. P. HENDERSON, formerly connected with the Detroit office of the Lincoln Electric Co., has been transferred to Chicago in charge of welder service. J. E. DURSTINE has been transferred from the experimental engineering department to the welder service department at Cleveland. J. W. SHUGARS of the time study department at Cleveland, and R. D. LAYMAN, also of Cleveland, have been transferred to Detroit. D. H. CARVER, formerly with the machine shop division at Cleveland, is now in the Ohio service division, with headquarters at Cincinnati. R. F. TERRILL has been transferred from the general engineering department at Cleveland to the eastern service division with headquarters at New York.

THOMAS B. FRANK, treasurer of the Cincinnati Planer Co., Cincinnati, Ohio, was elected president of the Cincinnati

Chapter of the National Association of Cost Accountants at the annual meeting. Mr. Frank has been active in accounting circles for a number of years, and has contributed considerably to the success of the Cincinnati Chapter. J. THOMAS OTTO, assistant comptroller of the Cincinnati Milling Machine Co., and HERBERT W. BOAL, comptroller of the Andrews Steel Co., were elected directors. EDGAR SWICK, office manager of the Laidlaw Works of the Worthington Pump & Machinery Co., was re-elected to the vice-presidency of the Chapter.

WILLIAM S. KRIEBEL, JR., has joined the Bridgeport Brass Co., Bridgeport, Conn., in the capacity of salesman. He will be located in the Philadelphia territory, and will make his headquarters at the Philadelphia office of the company, Bankers' Trust Building. Mr. Kriebel was formerly associated with the American Brass Co., and later served as vice-president and sales manager of an automobile accessory jobbing business.

A. H. TISCHER, formerly of the development engineering department of Foote Bros. Gear & Machine Co., 215 N. Curtis St., Chicago, Ill., has been transferred to the sales organization and is now covering part of the city of Chicago, the suburbs, and the steel district in South Chicago and northern Indiana.

HENRY S. DAY, manager of the transportation division of the Westinghouse Electric & Mfg. Co., East Pittsburg, Pa., has been selected by the United Electric Railways, of Providence, R. I., as superintendent of equipment. For the last five years he has had charge of all Westinghouse transportation activities in New England.

M. J. HARKLESS has been appointed sales engineer of the contractor's department of the Independent Pneumatic Tool Co., Chicago, Ill. Mr. Harkless was previously an engineer of the railway and marine supply department of the Buda Co., Harvey, Ill. He will make his headquarters at the general office of the company, 600 W. Jackson Blvd., Chicago.

PAUL D. CRAVATH, for thirty years general counsel, was elected temporary chairman of the board of directors of the Westinghouse Electric & Mfg. Co., East Pittsburg, Pa., at a recent meeting of the board of directors.

CHARLES R. TRIMMER, district representative for the Hannifin Mfg. Co., in the Michigan territory, has been made vice-president, in charge of sales, with headquarters at the company's Chicago plant, 621 S. Kolmar Ave.

W. W. WINSON, of the Bonney Forge & Tool Works, Allentown, Pa., who has been with the organization for quite a number of years, has been appointed district sales manager of the central district.

E. H. HAWKINS, divisional purchasing agent of the E. I. duPont de Nemours Co., New York, was elected president of the Purchasing Agents' Association of New York at the recent annual meeting.

COMING EVENTS

AUGUST 22-SEPTEMBER 3—Twelfth annual summer conference for industrial executives at the Pennsylvania State College, State College, Pa.

AUGUST 31-SEPTEMBER 2—Annual convention of the American Railway Tool Foremen's Association at the Hotel Sherman, Chicago, Ill. G. G. Macina, secretary, 11402 Calumet Ave., Chicago, Ill.

AUGUST 31-SEPTEMBER 2—First Steel and Power Show in the new Varsity Arena, Toronto, Canada. This exhibition is sponsored by the Montreal and Toronto Chapters of the American Society for Steel Treating; the Canada, Toronto, and Hamilton Councils of the Universal Craftsmen's Council of Engineers; the Toronto, Hamilton, and Dominion Executive of the Engineers' Mutual Benefit Fund, the Toronto Branch of the American Electroplaters' Society, the Montreal and District Engineers' Association, and the Canadian Section of the American Welding Society. General chairman of the exhibition, C. Bradshaw, 153 University Ave., Toronto, Canada.

SEPTEMBER 7-9—Seventh annual New Haven machine tool exhibition to be held in New Haven, Conn. Harry R. Westcott, Chairman Exhibition Committee, 400 Temple St., New Haven, Conn.

SEPTEMBER 12-17—International Congress for Testing Materials to be held at Amsterdam, Holland. The office of the Congress is Valkenierstraat 2, Amsterdam, Holland.

SEPTEMBER 19-22—Production meeting of the Society of Automotive Engineers to be held Monday and Tuesday, September 19 and 20 at the Hotel Winton, Cleveland, Ohio, and Wednesday and Thursday, September 21 and 22 at the Hotel Statler, Detroit, Mich. Secretary's address: 29 W. 39th St., New York City.

SEPTEMBER 19-23—National Machine Tool Builders' Association Exposition to be held in Cleveland, Ohio, under the direction of the association. For further information, address National Machine Tool Builders' Exposition Manager, Room 635, 1328 Broadway, New York City.

SEPTEMBER 19-23—Ninth annual convention and exposition of the American Society for Steel Treating to be held in Convention Hall, Detroit, Mich. For further information, address W. H. Eisenman, National Secretary, 4600 Prospect Ave., Cleveland, Ohio.

SEPTEMBER 26-OCTOBER 1—Eleventh annual exposition of chemical industries in the Grand Central Palace, New York City. For further information, address Publicity Department, Exposition of Chemical Industries, Grand Central Palace, New York City.

NEW BOOKS AND PAMPHLETS

DEVELOPING AND MANAGING SALESMEN. By Ray Giles. 216 pages, 6 by 8½ inches. Published by the Ronald Press Co., 15 E. 26th St., New York City. Price, \$3.50.

This book takes up the personal side of sales management, dealing with the relationship between the sales executive and his men. The book has been written about actual sales incidents in various lines of business, and contains many suggestions for increasing the efficiency of the selling force. The text is divided into twenty-three chapters, covering all phases of the subject.

MACHINE SHOP SCIENCE. By Joseph J. Eaton and Albert V. Free. 181 pages, 5¼ by 8 inches. Published by the Manual Arts Press, Peoria, Ill. Price, \$1.48, postpaid.

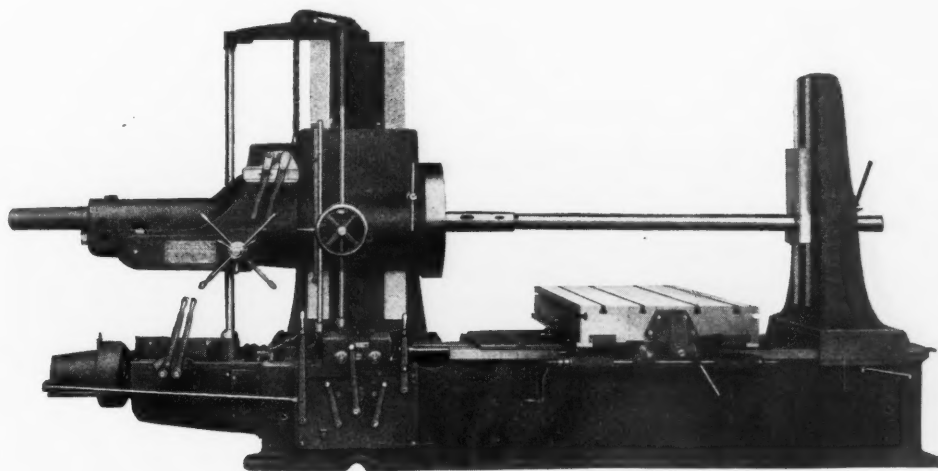
This little book presents, in an elementary way, that part of chemical, physical, and mathematical science which the machinist should know in connection with machine shop work on the lathe, drill press, planer, and milling machine. Throughout each chapter experiments, questions, and problems are given on each special subject taken up. The material is divided into eight chapters headed as follows: Weights and Measures; Simple Machines; Strength of

Plan Now to Visit Cleveland

September 19th-23rd

One of the Attractions at the
National Machine Tool Builders' Exposition
will be the **NEW MODEL No. 42**

LUCAS "PRECISION" Horizontal Boring Machine



An added incentive is the opportunity to visit the shop where
it is made, at East 99th Street and N. Y. Central R. R.

The LUCAS Power Forcing Press will be exhibited also.

THE LUCAS MACHINE TOOL CO., Cleveland, Ohio, U.S.A.

FOREIGN AGENTS: Alfred Herbert, Ltd., Coventry, Societe Anonyme Belge, Alfred Herbert, Brussels. Allied Machinery Co., Turin, Barcelona, Zurich. V. Lowener, Copenhagen, Oslo, Stockholm. R. S. Stokvis & Zonen, Paris and Rotterdam. Andrews & George Co., Tokyo. Ing. M. Kocian & G. Nedela, Prague. Schuchardt & Schutte, Berlin.

Materials; Force, Work, Energy; Heat and Its Effects; Motion; Shop Chemistry; and Compound Machines.

DIRECTING SALES. By H. C. Bonney. 121 pages, 6 by 8½ inches. Published by the Ronald Press Co., 15 E. 26th St., New York City. Price, \$3.

This book treats of the fundamentals underlying the problems facing the executive in charge of sales, and shows how successful methods and systems have been built up to fit a specific business. An idea of the points covered will be obtained from the following list of chapter headings: The Inefficiencies of the Past; The Growing Demand for More Scientific Sales Organizations; The Basic Work of the Modern Sales Executive; The Inside Sales Department; The Hiring of Salesmen; The Paying of Salesmen; The Training and Control of Salesmen; Creating the Incentive to Sell; The Fundamentals of Advertising.

HOUSE HEATING WITH OIL FUEL. By P. E. Fansler. 354 pages, 7 by 10 inches. Published by the Heating and Ventilating Magazine Co., 1123 Broadway, New York City. Price, \$4.

Because of the widespread interest in the use of oil fuel for domestic heating purposes, a third edition of this book has now been published, bringing the text completely up to date. The treatment is such that it will be useful both to the non-technical and the technical reader. The book gives established facts and figures relating to the use of oil fuel in homes, from the technical, practical, and economical points of view. It has been prepared especially for use by the heating and ventilating engineer, the heating contractor, architects, those engaged in the oil-burning industry, and users of oil-burning equipment.

FOREMANSHIP. By Glenn L. Gardiner. 680 pages, 5½ by 8½ inches. Published by the A. W. Shaw Co., Cass, Huron and Erie Sts., Chicago, Ill. Price, \$6.

This book contains an exhaustive discussion of the foreman's duties from all points of view, both technical and those concerning human relations. The author has a broad outlook on the subject, having been a factory worker, foreman, and executive. He has drawn upon his own experience and has included ideas obtained as the result of round-table discussions with hundreds of foremen. The text is divided into six main parts, containing, in all, thirty chapters. The first section deals with the place of the foreman in industrial management, and his qualifications. The next two sections discuss methods and systems for handling work. Book IV takes up the subject of developing foremen. Book V discusses methods of handling the men, wage problems, labor turnover, etc. The concluding section treats of industrial economics.

STANDARDS OF THE HYDRAULIC SOCIETY. 78 pages, 8½ by 11 inches. Published by the Hydraulic Society, 90 West St., New York City. Price, 50 cents.

The Hydraulic Society is a trade association comprising the principal manufacturers of displacement and centrifugal pumps in the United States. The society cooperates with the Department of Commerce, the United States Chamber of Commerce, the American Society of Mechanical Engineers, the American Mining Congress, and the National Fire Protection Association, as well as with other trade associations in other industries, and with other technical and commercial organizations with which the pump industry has problems in common. Pursuant to its aim to be of service to engineers, buyers and users of pumps, as well as to its own members, the society collects technical, engineering, and commercial pump data. It recommends standard definitions, terms, and practices, where such action appears to be feasible, and it has compiled this information in the present book of standards. The first edition of this book was published in 1921, the present issue being the fourth edition. It is believed that the general adoption of the recommendations will be of mutual advantage to users of pumps, the engineering profession, and pump manufacturers.

NEW CATALOGUES AND CIRCULARS

TUMBLING MILLS. Whiting Corporation, Harvey, Ill. Bulletin 183, illustrating and describing the construction of the new Whiting tumbling mills.

SHAPERS. R. A. Kelly Co., Xenia, Ohio. Bulletin illustrating and describing in detail Kelly 26- and 32-inch NT crank shapers. Complete specifications are included.

STEEL. Carpenter Steel Co., Reading, Pa. Booklet of Carpenter tool steels for hot work. The text covers the problems met with in the hot-working of metals, and their solution.

COMBUSTION CONTROL. Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa. Bulletin 660, descriptive of the Gibson system of automatic combustion control for boiler furnaces.

TURRET LATHES. Jones & Lamson Machine Co., Springfield, Vt. Circular containing production data on a job performed on the J & L flat turret lathe with cross-sliding headstock.

BALL-BEARING HANGER BOXES. T. B. Wood's Sons Co., Chambersburg, Pa. Bulletin 369, giving price lists and other data on Wood-Fafnir ball-bearing hanger boxes and pillow blocks.

PORTABLE ELECTRIC TOOLS. Standard Electrical Tool Co., 1936 W. Eighth St., Cincinnati, Ohio. Leaflet illustrating Standard high-power portable electric drills, grinders, and buffers.

HEATERS. American Blower Co., 6000 Russell St., Detroit, Mich. Bulletin announcing a new "smaller sized model of the "Venturafin" heater, for stores, small factories, offices, garages, etc.

ELECTRIC REFRIGERATION EQUIPMENT. Mueller Brass Co., Port Huron, Mich. Circular containing data on Mueller standard electric refrigerator shut-off valves and flared tube fittings.

VARIABLE-SPEED TRANSMISSIONS. Reeves Pulley Co., Columbus, Ind. Circular entitled "A Vital Necessity in Every Industry," containing information on Reeves variable-speed transmissions.

MATERIAL-HANDLING EQUIPMENT. Herbert Morris, Inc., Buffalo, N. Y. Book 106, illustrating Morris overhead runways and their application in different plants for handling a variety of work.

MILLING MACHINES. Ingersoll Milling Machine Co., Rockford, Ill. Bulletin illustrating and describing Ingersoll open-side milling and boring machines, and adjustable-rail milling machines, for general work.

POWER TRANSMISSION MACHINERY. T. B. Wood's Sons Co., Chambersburg, Pa. Leaflet entitled "70 Years of Service," issued in commemoration of the seventieth anniversary of the founding of this company.

BALL BEARINGS. New Departure Mfg. Co., Bristol, Conn. Sheet 179-FE for loose-leaf circular, illustrating the application of ball bearings in a ten-spindle multiple drill head. Price lists of single-row and double-row ball bearings.

STRAIGHTENING PRESSES. Metalwood Mfg. Co., 3358-3366 Wight St., Detroit, Mich. Circular illustrating Metalwood straightening presses, which are made in six types and fourteen sizes, ranging from 10 to 200 tons capacity.

HARDENING EQUIPMENT. Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa. Circular 2 in a heat-treating series, discussing the use of the Hump method of hardening, and the selection of hardening equipment.

ELECTRIC MOTORS. Wagner Electric Corporation, St. Louis, Mo. Bulletins 149 and 150, describing, respectively, the new Wagner "66" motor, in sizes of 1/6, ¼, and 1/3 horsepower and the Wagner "76" motor, in sizes of ½, ¾, and 1 horsepower.

INSPECTION EQUIPMENT. Comtor Co., Waltham, Mass. Publications J and K, describing, respectively, the "Comtorplug" and the "Comtorgage" which are used for production and inspection measurement of inside and outside machine diameters.

PRESSES. Cleveland Punch & Shear Works Co., Cleveland, Ohio. Circular illustrating Cleveland power presses of various types and sizes, and other machine tools, including punches and shears, planers, bending and straightening machines, etc.

GRINDING MACHINES. Blanchard Machine Co., 64 State St., Cambridge, Mass. Circular entitled "More and Better Work," illustrating the application of the Blanchard grinder for grinding locomotive packing rings and the wing shaft for a shock absorber.

ELECTRIC FITTINGS. Crouse-Hinds Co., Syracuse, N. Y. Bulletin G-3, containing data on type GCE groundnuts. Bulletin G-4, containing an article entitled "Grounding for Safety," by S. W. Borden. Bulletin G-5, illustrating different types of groundnuts and other safety circuit devices.

ELEVATORS. Link-Belt Co., 910 S. Michigan Ave., Chicago, Ill. Book 680, entitled "Link-Belt Typical Elevators," containing illustrations, examples, ratings, capacities, and tables showing how to select typical elevators that are applicable to average conditions for handling practically all materials in bulk.

CHAINS AND TRANSMISSION EQUIPMENT. Chain Belt Co., Milwaukee, Wis. Catalogue 220, containing list prices, weights, and dimensions of "Rex" chains and transmission equipment. Complete data for ordering and a detailed description of the various types of chains and their uses are included.

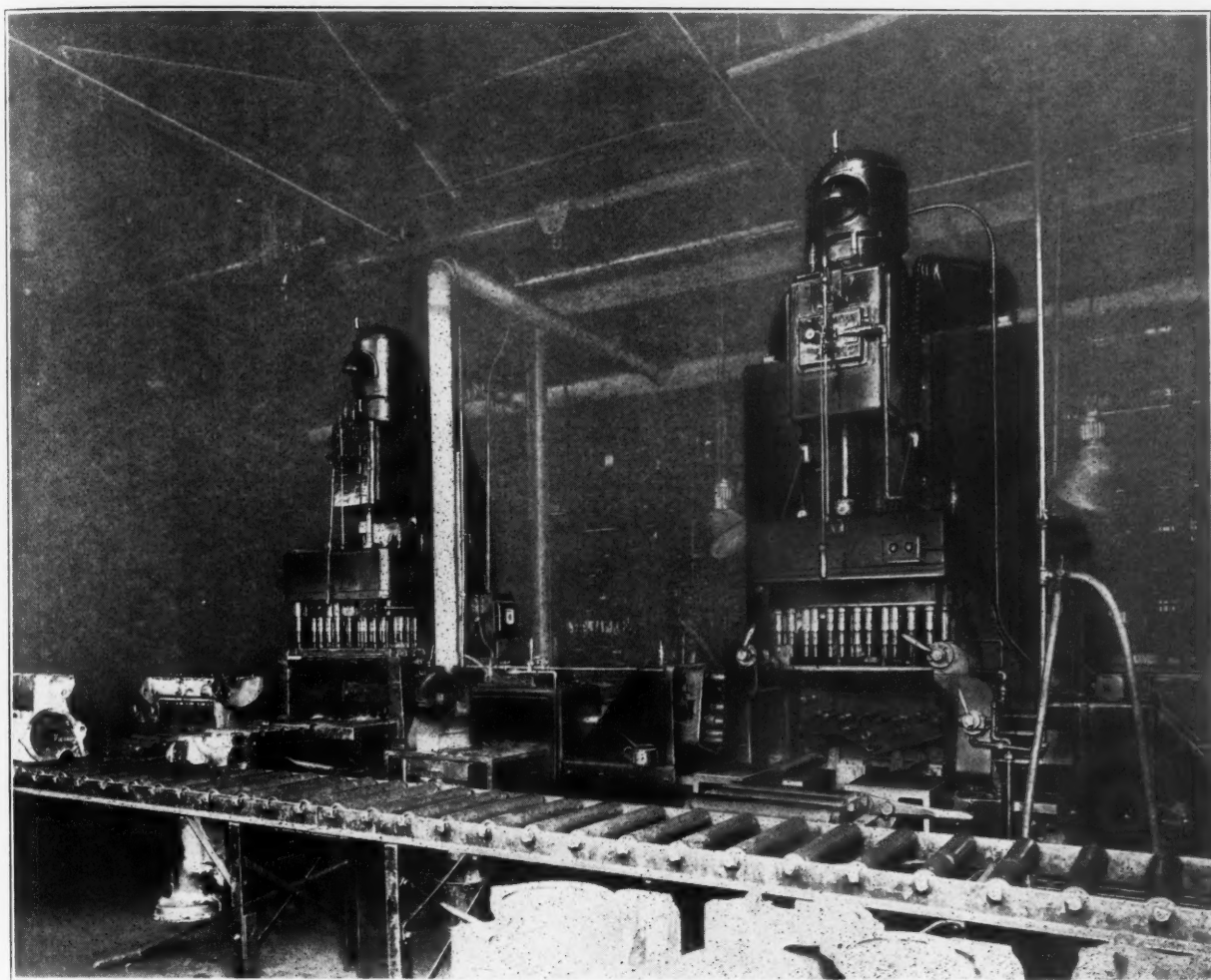
OXY-ACETYLENE WELDING EQUIPMENT. Linde Air Products Co., 30 E. 42nd St., New York City. Booklet entitled "Long Pipe Lines with Oxwelded Joints," containing illustrations showing typical examples of the application of the oxy-acetylene process to the welding of long pipe lines in the oil and gas industries.

BALL BEARINGS. Strom Bearings Co., 4563 Palmer St., Chicago, Ill. Catalogue 11, containing information covering the complete line of Strom ball bearings and M-R-C thrust bearings. In addition to dimensions and load ratings of Strom radial, angular contact, and thrust bearings, the booklet contains tables of interchangeable sizes of ball bearings.

WELDING EQUIPMENT. Lincoln Electric Co., Coit Road and Kirby Ave., Cleveland, Ohio. Booklet entitled "Modern Manufacturing with a Stable-Arc Welder," outlining briefly the theory of the use of arc welding in production manufacturing, and showing recent applications of the arc welding process. Complete data is given, including costs of arc welding.

ELECTRIC EQUIPMENT. General Electric Co., Schenectady, N. Y. Publication entitled "Motor Drives for Rolling Mills," containing a partial list of main roll motors supplied by the company up to January 1, 1927. Bulletins GEA-743 and GEA-780, treating, respectively, of drum controllers and solenoid-operated air circuit breakers. Circulars GEA-754 and GEA-765, illustrating and describing, respectively, semi-automatic reducing voltage starters for synchronous motors, and CR7006-D20 magnetic switches.

GEAR-CUTTING MACHINERY. Gleason Works, Rochester, N. Y. Catalogue entitled "Machine Tools for Cutting the Teeth of Straight and Spiral Bevel Gears." This catalogue contains, in addition to illustrated descriptions of a large number of machines, a great deal of information relating to spiral bevel gears, their advantages, strength, efficiency, application, and mounting. It also gives formulas for determining the axial thrust, and practical points on the design of spiral bevel gears. Machines for straight bevel gears are also illustrated and described, and such information given as would be required by the user. The catalogue is of the loose-leaf form and inserted in a handsome loose-leaf binder.



HERE is a typical example of the way Leland-Gifford solves a particular tapping problem.



Photograph shows two Leland-Gifford special way tapping machines tapping five sides of cylinder block and upper half of crank case.

Leland-Gifford regular or special drilling and tapping machines will meet the demands of your production.

LELAND-GIFFORD COMPANY, Worcester, Mass., U. S. A.

BRANCHES

Boston

Chicago

Cleveland

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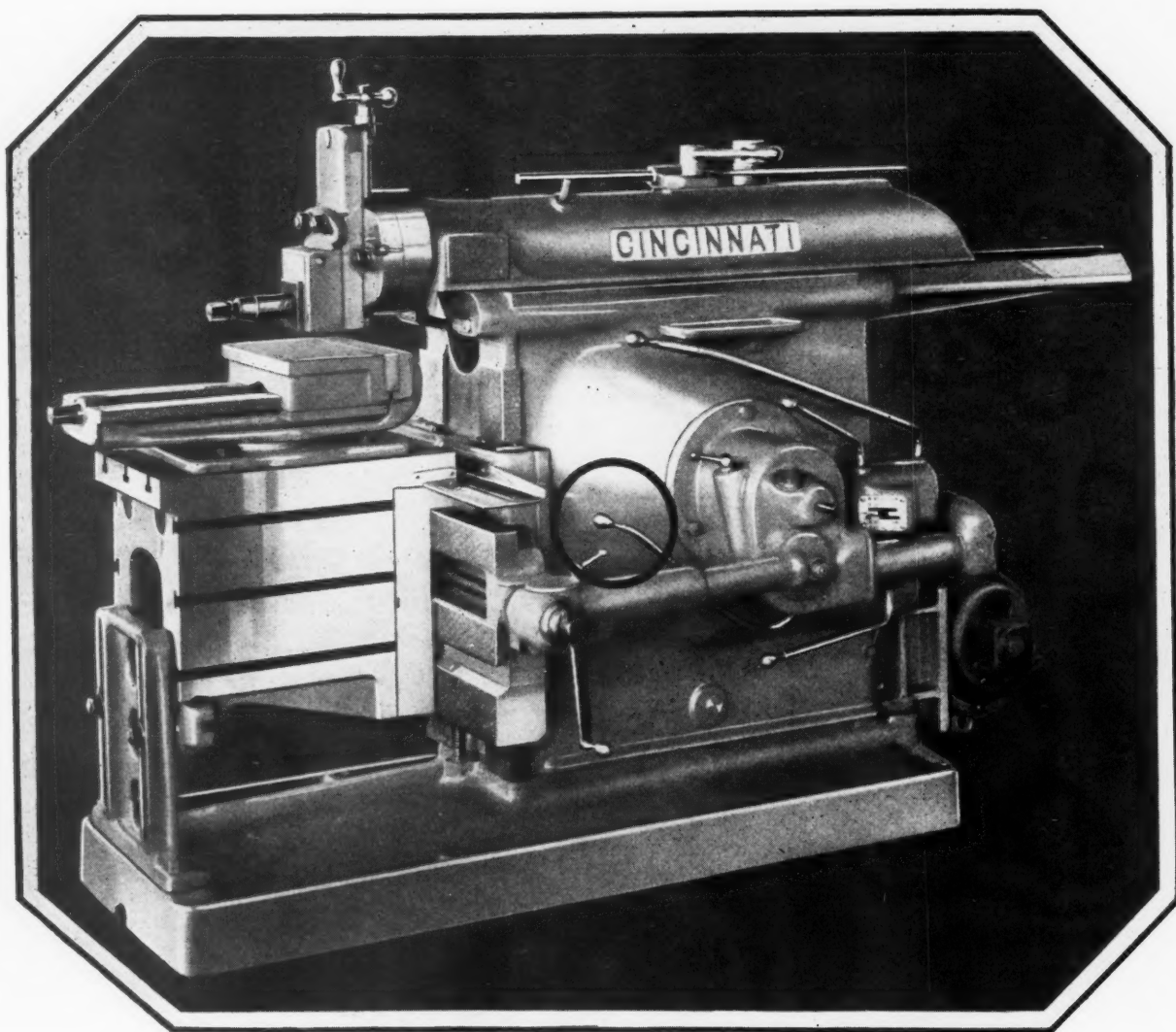
New York

Pittsburgh

Rochester

LELAND - GIFFORD

Cincinnati puts Power Rapid



The central lever, close to the operator's hand, engages the Power Rapid Traverse.

The regular feed engagement lever controls the right or left traverse of the table.

The quick traverse operates directly off the drive pulley at any time.

The drive is through the feed friction shaft—a safeguard against damage if run to the extreme end of the rail.

A new ratchet feed crank hangs free in place during rapid traverse but is ready for instant use in hand feeding.

No additional oiling is required—all automatic.

Traverse on Shapers !

THE greatest advance in Shaper efficiency since the introduction of automatic oiling on Cincinnati Shapers in 1924!

Power Rapid Traverse instantly shifts the table to the right position for the next job—moves the work up to the tool for the cut—reduces the time between cuts to little or nothing. There will be no more grinding the table from one side of the Shaper to the other.

Power Rapid Traverse has for some time been a recognized standard on the Planer and the Milling machine. Now we offer the same advantages for the Shaper.

This makes the Cincinnati truly the “high speed” Shaper—in strokes per minute, easy control, quick set-up and shorter time between the cuts. And all this speed comes with less effort rather than more on the part of the operator.

THE CINCINNATI SHAPER COMPANY
CINCINNATI, OHIO

Cincinnati Shapers
Rapid Traverse

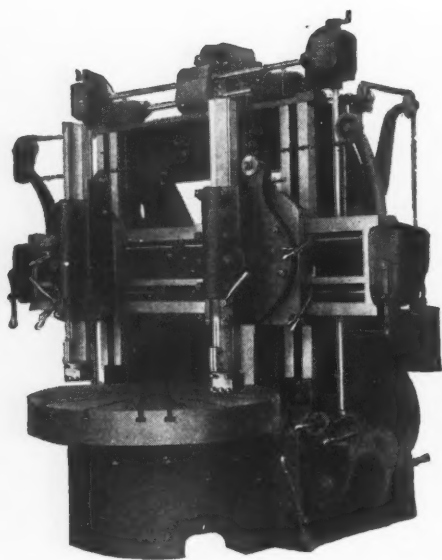
Where *the* Mississippi starts!



DO you know where? But if you were told, authoritatively, that there was a pot of gold buried at the source, you would trace the river to its beginning.

When costs are high in the machine shop and profits small have you traced the loss to its source? You may find that several old machine tools are hiding your "pot of gold."

Find out. Let us help you. For instance, your boring mills may be out of date—you may need Niles Boring Mills. They are heavy, rugged, modern machines that are powerful and easy to operate. The cost of doing work on them is but a fraction of what an old machine costs at its best. *We* know what a new boring mill can do. *You* know what your old boring mills are doing. A comparison will show if the machines are wasting money in your shop. Call in a Niles Sales Engineer to go over your boring mills with you. We'll gladly co-operate and supply any details you desire.

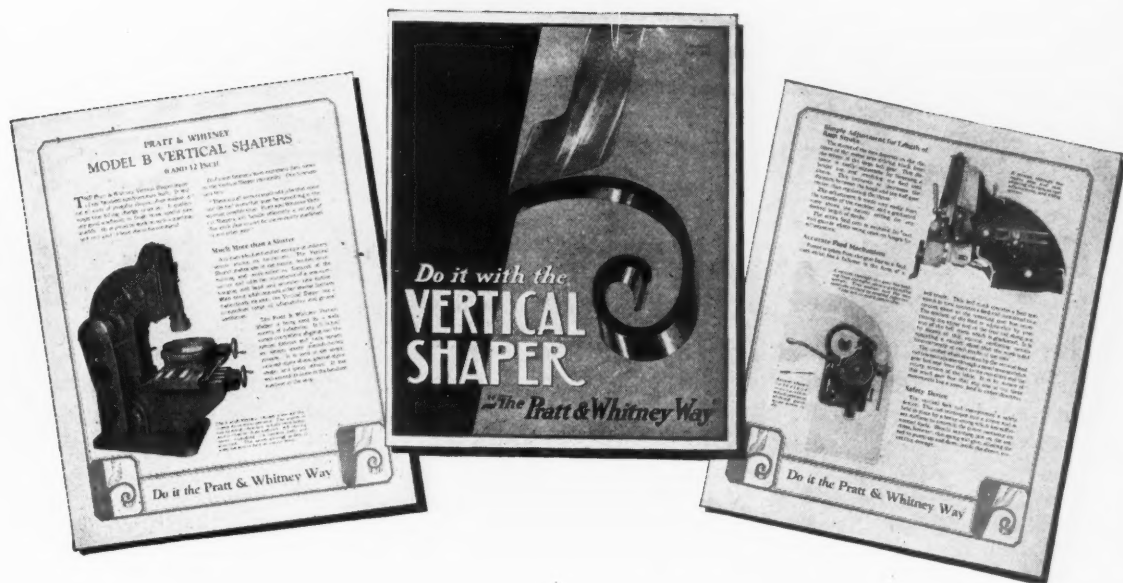


NILES heavy vertical boring and turning mills are built in a range of sizes from 42" swing up to any desired capacity.

The Niles Tool Works Company

DIVISION NILES-BEMENT-POND COMPANY

Hamilton, Ohio



Learn How and WHY this machine saves , ,

THE methods by which P & W Vertical Shapers save money and the mechanical details of how they do work faster are shown in this book.

If you use milling machines, horizontal shapers or slotters in your shop you should write for this book which contains some valuable information for you.

In it are told the reasons for the superiority of the vertical design and how intricate shapes can be finished without costly fixtures and set-up changes.

It is an invaluable machine to the die maker and has proved itself a money saver in tool rooms, on production work and in railroad repair shops.

The P & W Vertical Shaper is infinitely more than a slotter. It is adaptable to a wide range of tool room and production work.

PRATT & WHITNEY CO., Hartford, Connecticut
Division NILES-BEMENT-POND COMPANY

Sales Offices

BIRMINGHAM, ALA.
BOSTON, MASS.
CINCINNATI, OHIO
CHICAGO, ILL.

CLEVELAND, OHIO
DETROIT, MICH.
LOS ANGELES, CAL.
NEW YORK, N. Y.
ST. LOUIS, MO.

PITTSBURGH, PA.
PHILADELPHIA, PA.
ROCHESTER, N. Y.
SAN FRANCISCO, CAL.

*Cut out this
Coupon—
Mail it
today—*

Pratt & Whitney Co.
Kindly send me a copy of circular No. 333

Name

Address

City & State

Company Name—

Your position

E

Investing in

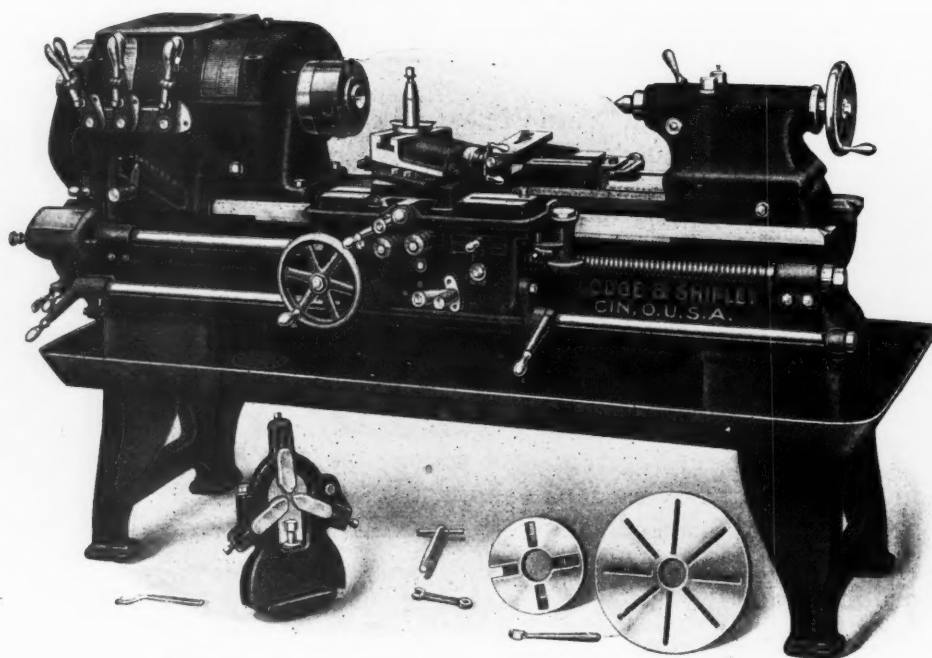
The cautious machine tool buyer does

There is a big difference between the two. The man who really *spends* money for machine tools is the one who buys entirely on price. He thinks only of the initial outlay of money and overlooks entirely the length of service and the maintenance expense.

On the other hand the man who *invests* his money in machine tools determines beforehand which one has quality *built into it*. He chooses a machine that is known for its low upkeep and long period of service. He knows that the initial price is not everything. His experience has taught him that maintenance and service *MUST* be taken into consideration before the machine is bought. If he installed a machine that continually would be down for repairs he not only would lose its services but the machine would be everlastingly costing him more.

The proper way to figure the cost of a lathe is the purchase price plus maintenance. How have you been figuring it? Ask this question of the man who uses

The Lodge & Shipley Lathe



16" Selective Head Lodge & Shipley Tool-Room Lathe



Send for Literature

The Lodge & Shipley

Cincinnati, Ohio

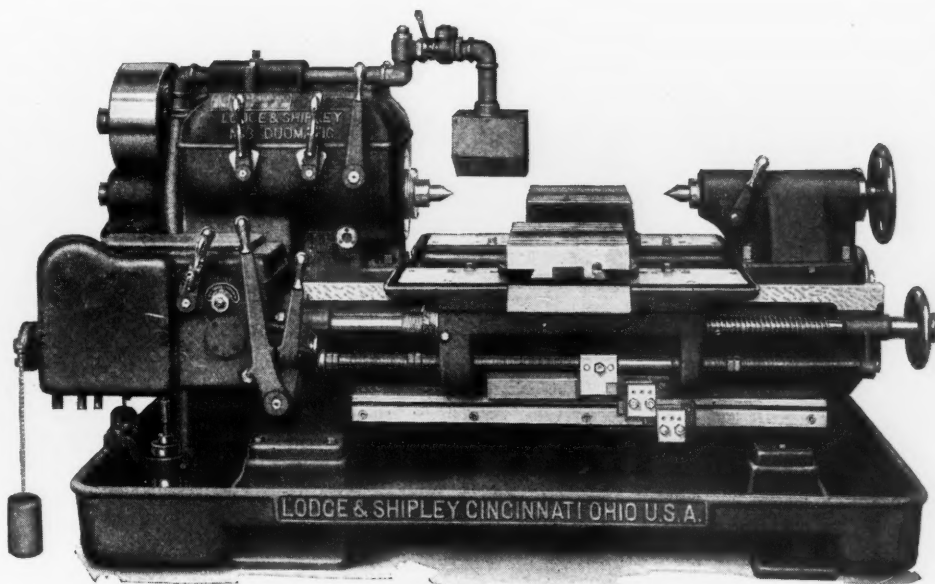
n machinery!

es not spend his money—He invests it!

You, like everyone else, want your money's worth. You want to get dollar for dollar back for every one you spend. This can be done if you *invest* your money. Buy a tool you know will last over a long period of time; one that has accuracy *built into it*. Such a machine will gradually pay for itself in the quality of work it does and in years of added service. Even if you do not use such a machine all its useful life, it always commands a high resale value. Get rid of the idea that the additional money spent for a *good* machine is money gone. It will come back to you as sure as the sun will rise tomorrow.

Rather than take a "flyer" on something that looks good, a cautious buyer "invests" in something he *knows* is good. He has investigated; he has found out to his complete satisfaction that by getting the best, he is actually spending the least. Once you have been convinced of this you will no longer cut down the purchase price. Talk this point over with anyone who owns

The Lodge & Shipley Lathe



The Lodge & Shipley No. 3 DUOMATIC

Send for Literature

ey Machine Tool Company
ati, Ohio

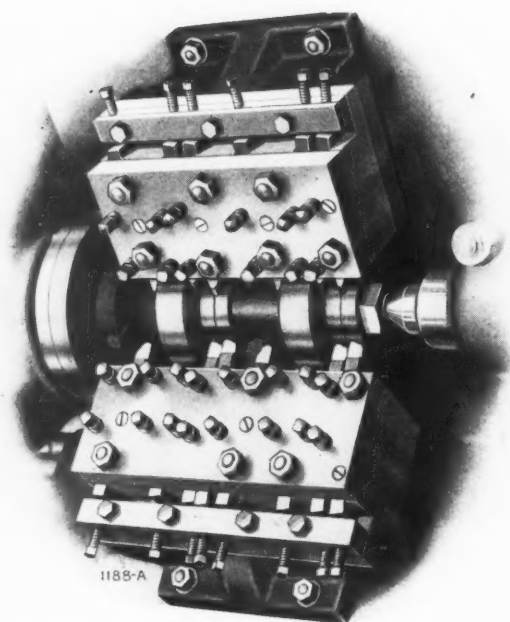




LEBLOND

No. 12

HEAVY MULTI-CUT LATHE

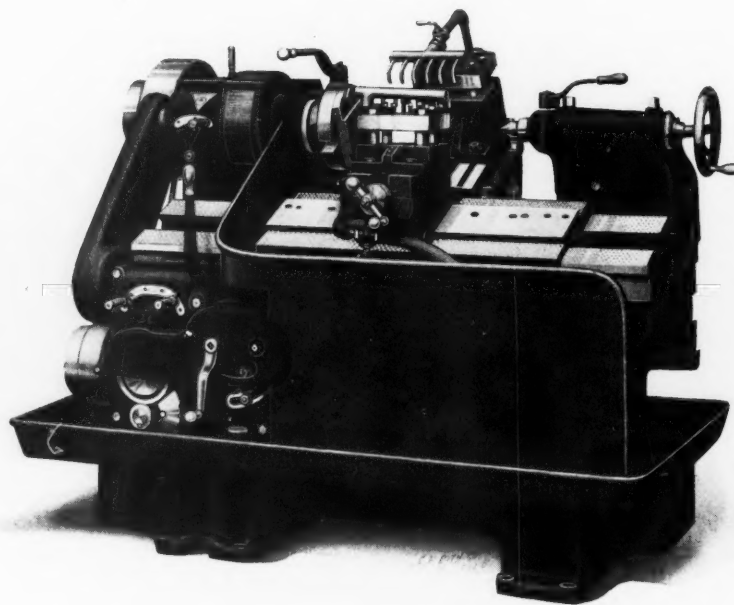


A highly developed semi-automatic lathe for simultaneous turning and facing cuts with multiple tools. A transmission pinion job is illustrated, the production being thirty parts per hour on the roughing operation, machining two parts at a time on an arbor, one operator handling two machines.

See this machine in operation on a similar job at the National Machine Tool Builders' Exposition. It will be a decidedly interesting demonstration of advanced machining practice on work of this sort.



Multi-Cutting
is
Cost Cutting



THE R. K. LEBLOND MACHINE TOOL CO.
CINCINNATI, OHIO

1st

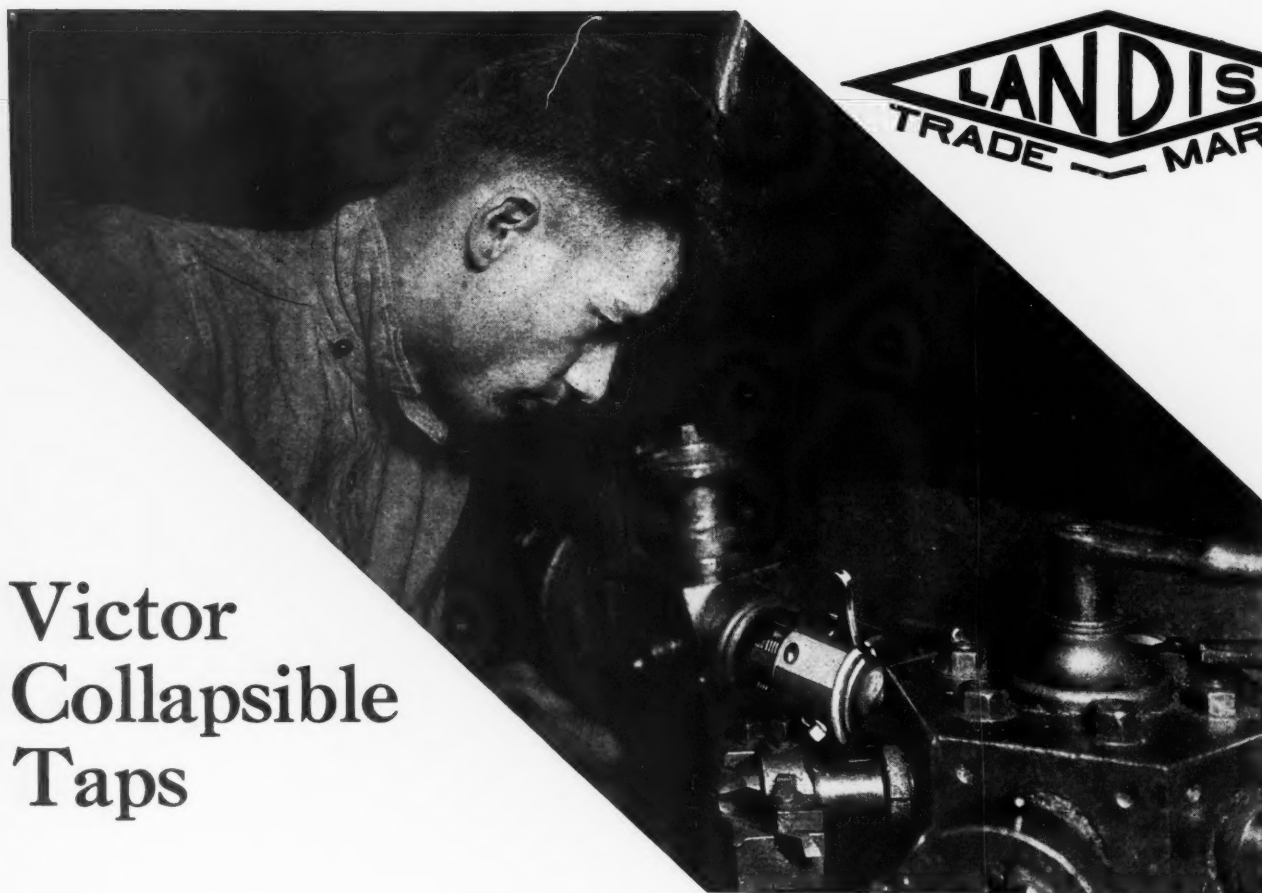
*M*ORE BALL BEARINGS
ARE BEING PRODUCED
~ ~ THAN ALL OTHER
ANTI-FRICTION BEARINGS
COMBINED ~ ~ ~

FAFNIR
BALL BEARINGS



THE FAFNIR BEARING COMPANY ~ NEW BRITAIN ~ CONNECTICUT

Landis Threadi



Victor Collapsible Taps

"Get maximum production, cut perfect threads,"

says this user



The superintendent of this well-known plant considers Victor "the best collapsible tap on the market"—and as the plant produces heating and steam plant equipment and feed water heaters there are plenty of tapping operations on which to base his opinion.

Victor users are frequently as enthusiastic about Victor Taps—making stronger statements than we would permit to ourselves.

As usual *we* do not claim that Victor Taps are "best"; *we* only say that they are as good as engineering skill and honest work can make them—our customers say the rest!

LANDIS MACHINE COMPANY, Inc.

Detroit Office: 5928 Second Boulevard

DOMESTIC AGENTS: Marshall & Huschart Machinery Co., Chicago, Ill.; Marshall & Huschart Machinery Co. of Indiana, Indianapolis, Ind.; Colcord-Wright Machinery & Supply Co., St. Louis, Mo.; R. B. Whitacre & Company, St. Paul, Minn.; Hamilton Machinery Co., Chattanooga, Tenn.; Young & Vann Supply Co., Birmingham, Ala.; Woodward, Wight & Co., New Orleans, La.; Shreveport, La.; Tampa, Fla.; Jos. T. Ryerson & Sons, Houston, Texas; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.; Salt Lake Hardware Co., Salt Lake City, Utah; Herberts Machinery & Supply Co., San Francisco, Calif.; Herberts Machinery & Supply Co., Los Angeles, Calif.;

ding Equipment

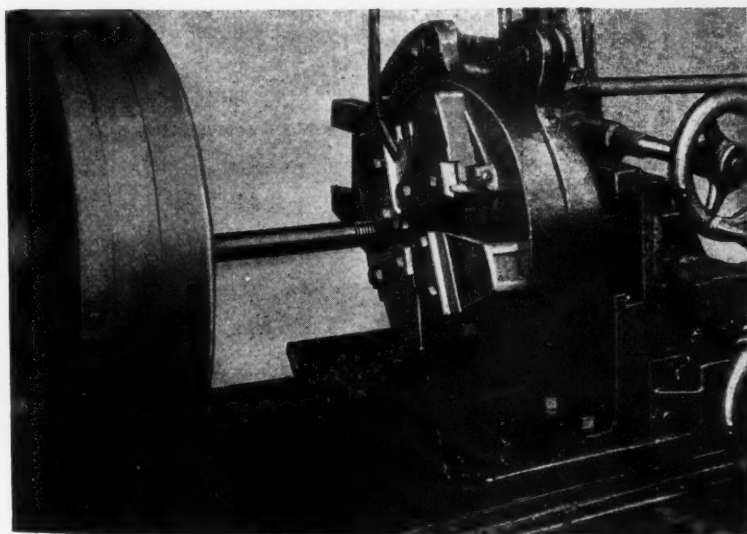
Landis Pipe Threading and Cutting Off Machines

Essential production equipment in a big pipe plant

Accurate cutting off, clean, accurate threading are essentials in the pipe manufacturing plant. Therefore, the H. Belfield Co., Philadelphia, Pa., installed Landis Pipe Cutting and Threading Machines to handle all work up to 2".

The work in operation is cutting off $\frac{1}{2}$ " steel pipe 15" long, production 400 pieces in 7 hours. On another job the operator cut 5000 pieces of $\frac{3}{4}$ " pipe in 8- $\frac{2}{3}$ hours with only one resharpening of the cutting tools.

Landis Threading Machines and Tools insure accurate threads, low threading and cutting-off costs. They get results on important work!



Waynesboro, Pennsylvania, U. S. A.

Harry M. Euler Co., Portland, Ore.; Hallidie Machinery Co., Seattle, Wash.; Hallidie Co., Spokane, Wash.; R. S. Armstrong & Bro. Co., Atlanta, Ga.

CANADIAN AGENTS: Canadian Fairbanks-Morse Co., Toronto and Montreal.

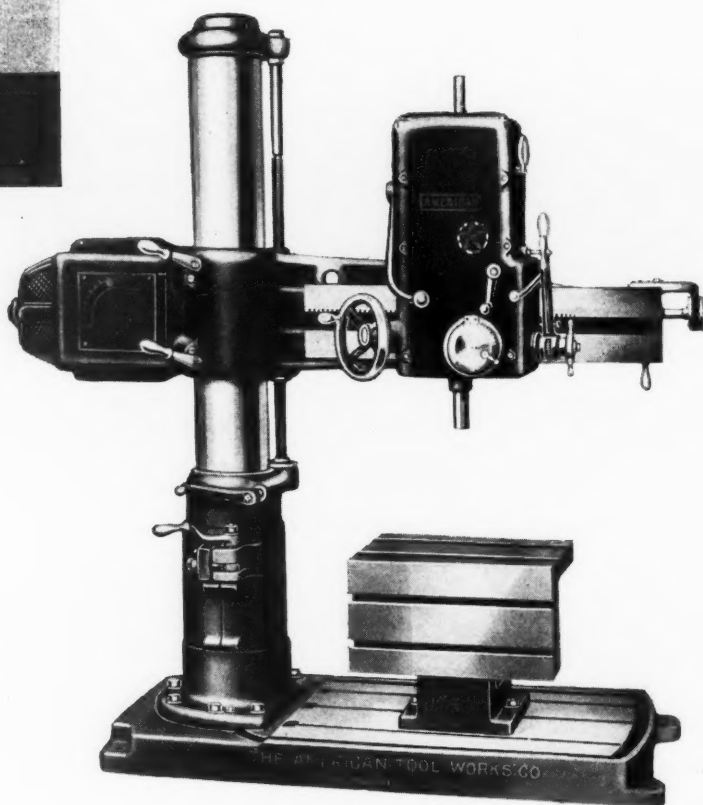
FOREIGN REPRESENTATIVES: Benson Brothers, Ltd., Sydney; Schuchardt & Schutte, Berlin, Vienna, Prague, Warsaw; R. S. Stokvis & Zonen, Rotterdam, Brussels, Soerabaya; M. Almeida & Cia, Sao Paulo, Rio de Janeiro; Alfred Herbert, Ltd., Coventry, Calcutta, Osaka; Burton Fils, Paris; D. Drury & Company, Johannesburg.

The Range of a Radial



IN the "American" Maxi-Speed Ball Bearing Sensitive Radial Drill you get a machine substantially made by one of the largest established builders of machine tools—a machine that is fast, and so precise and reliable that its advent opened an entirely new field to high speed drilling; a wider range of work, greater output, less cost per unit, fewer delays and less repairs.

The outstanding characteristics of this machine are closely tied up with present-day production needs of rapid and economical operation—power, speed, operating convenience.



THE AMERICAN TOOL

"AMERICAN"

"AMERICAN"



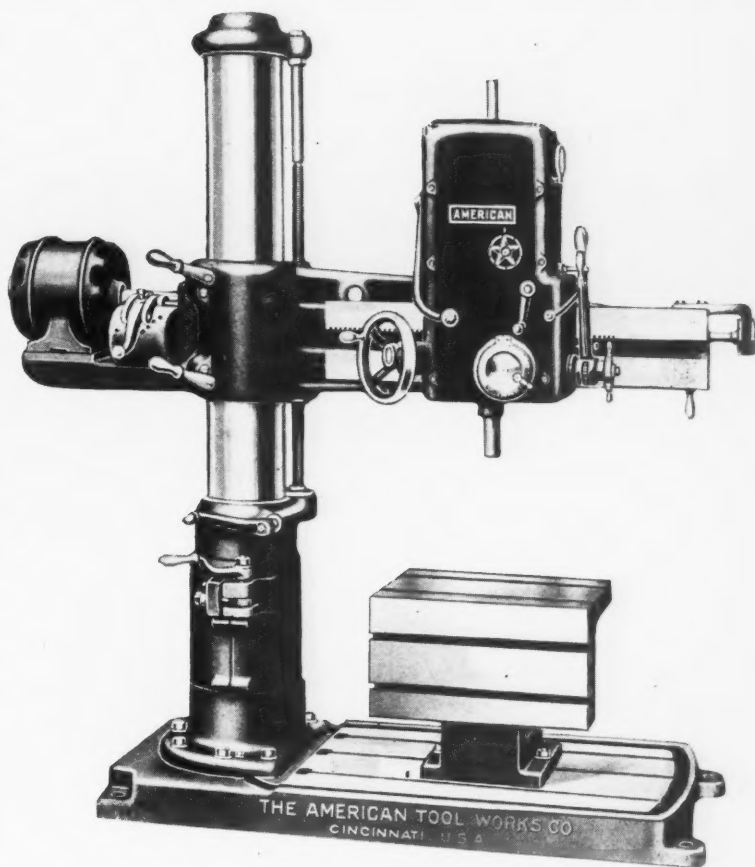
The Speed and Efficiency of a Sensitive Drill

THE "American" Maxi-Speed Sensitive Radial drills and taps holes up to and including 1 inch in diameter faster, better and cheaper than they have ever been drilled and tapped before. This is a powerful, sturdy, dependable machine, endowed with the convenience and range of the radial drill, combined with the speed and efficiency of the sensitive drill.

All ball bearing throughout, and unencumbered by the average belt complication, it provides a most productive machine, with speeds from 500 R. P. M. to 2000 R. P. M.; ideally adapted to drilling, tapping and counterboring switchboards, automobile chassis, transmission cases, engine frames, automobile accessories, electrical parts, cash registers and sewing machine details, and to a wide variety of other work of a similar nature.

There is a definite place in your shop for the Maxi-Speed, Sensitive Radial.

Let us show you where.



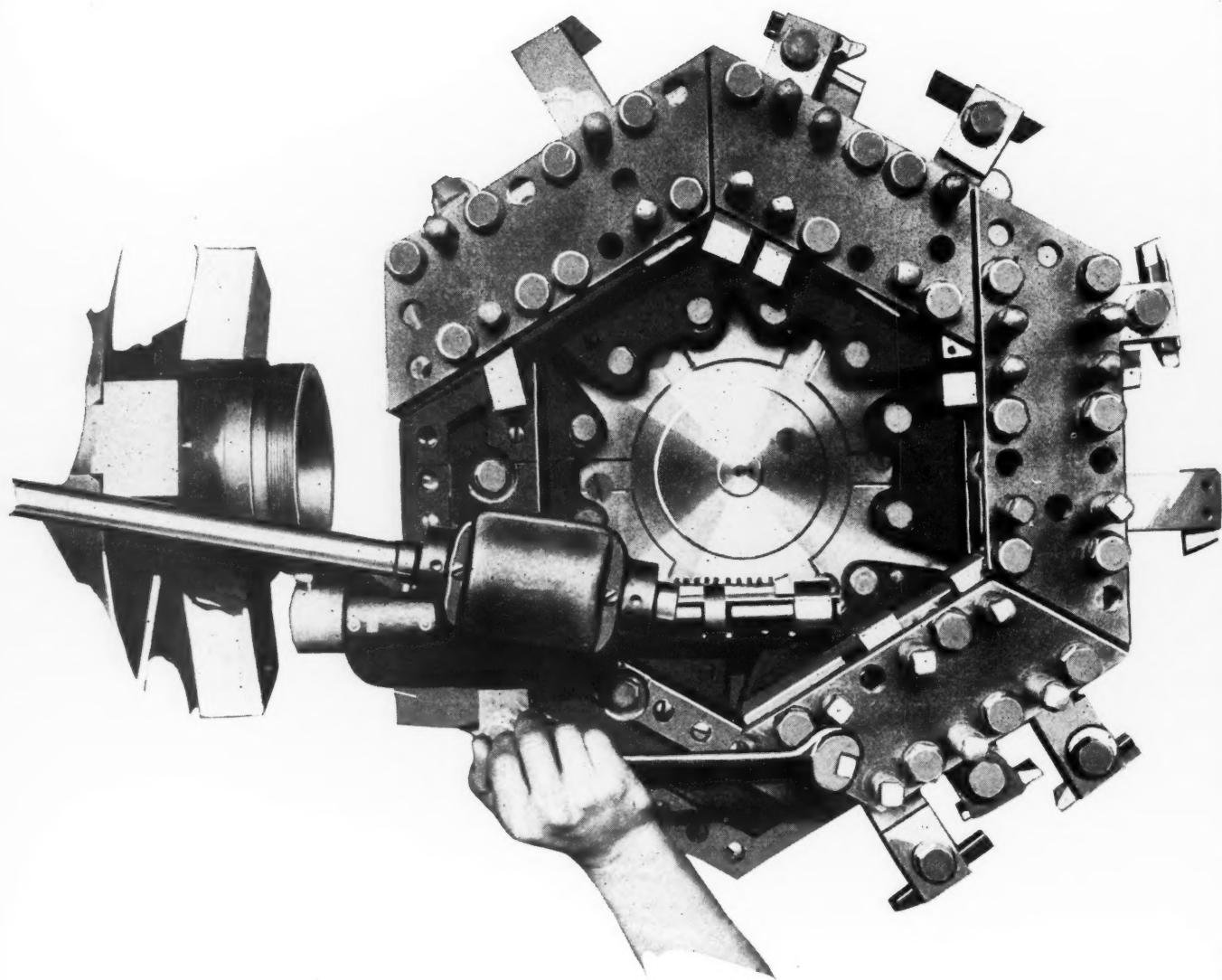
LATHES
RADIALS
SHAPERS

OL WORKS CO., Cincinnati, U. S. A.

” Maxi-Speed BALL BEARING
SENSITIVE RADIAL DRILL

J&L
JONES & LAMSON

The Best T



J&L
JONES & LAMSON

Jones & Lamson

Springfield, Vt

Hartness Flat Turret Lathe
Fay Automatic Lathe
Hartness Double Spindle
Flat Turret Lathe

Pacific Coast Agents:

SAN FRANCISCO, CALIFORNIA
C. F. Bulotti Machinery Company
829-831 Folsom Street

SEATTLE, WASHINGTON
Perine Machine Company
209 First Avenue, South

LOS ANGELES, CALIFORNIA
Reeves & MacBride
443 East Third Street

PORTLAND, OREGON
Woodbury & Wheeler
55 Second Street

t Turret Lathe

J&L
JONES & LAMSON

is one that

Permits

Maximum Multiple Tooling

Presents

Greatest Number of Tools Cutting Simultaneously.

Provides

Simple, Inexpensive, Standard Tooling.

Machine Company
Vermont, U. S. A.

J&L
JONES & LAMSON

Foreign Agents:

LONDON, ENGLAND, 19-21 Water Lane,
Queen Victoria Street
HOLLAND, Spliethoff, Beeuwkes & Co.
Luevehaven, Wz., 159 Rotterdam
SPAIN, BELGIUM, SWITZERLAND, PORTUGAL
AND ITALY, Fenwick Freres & Co.
8 Rue de Rocroy, Paris, France

GERMANY, M. Koyeman, m. b. H. Dusseldorf
JAPAN, KOREA, MANCHURIA, FORMOSA,
Mitsui Co., Ltd., Tokio
FRANCE, Fenwick Freres & Co., 8 Rue de Rocroy
Ing. M. Kocian & G. Nedela,
Palmovka, Praha VIII, Czechoslovakia

Hartness Automatic Die
Flanders Ground Tap
Hartness Screw Thread
Comparator

FAMOUS SEXTETTES

6 FAMOUS PHILOSOPHERS



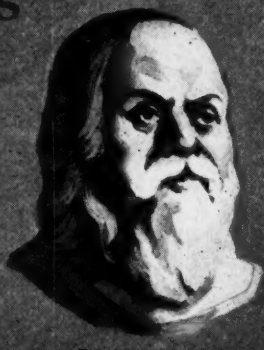
MARCUS AURELIUS



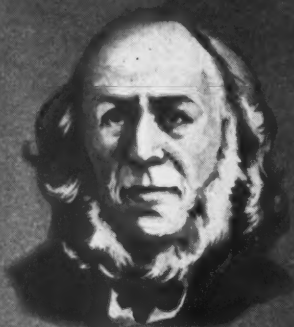
CONFUCIUS



DAVID HUME



SOCRATES



HERBERT SPENCER



VOLTAIRE

6 - FAMOUS TOOLS



CLE-FORGE HIGH SPEED DRILLS
TRADE MARK REG. U.S. PAT. OFF.



PEERLESS HIGH SPEED REAMERS
TRADE MARK REG. U.S. PAT. OFF.



Quick-Set
Adjustable Reamer



EZY-OUT
SCREW EXTRACTORS



MEZZO
SUPER-CARBON DRILLS



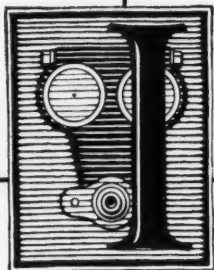
Spirex
MACHINE TAPER PIN REAMERS

The **CLEVELAND** TWIST DRILL COMPANY
CLEVELAND
NEW YORK - CHICAGO - LONDON

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

Manufacturers of Carbon and Cle-Forge High Speed Drills for every purpose; "Mezzo" Super-Carbon Drills; Hand, Jobbers' and Shell Reamers; "Peerless" High Speed Reamers; "Paradox" Adjustable Reamers; "Quick-Set" Reamers; "Spirex" Machine Taper Pin Reamers; Chucking Reamers for Turret Lathes; Counterbores; Countersinks; Sockets; End Mills; and the "Ezy-Out" Screw Extractor.





Introducing

Two new Milling Machines

The No. 2 STANDARD

The No. 3 STANDARD

The new No. 2 and No. 3 STANDARD Milling Machines again demonstrate the constant effort of Kearney & Trecker to build their products to meet your exact requirements.

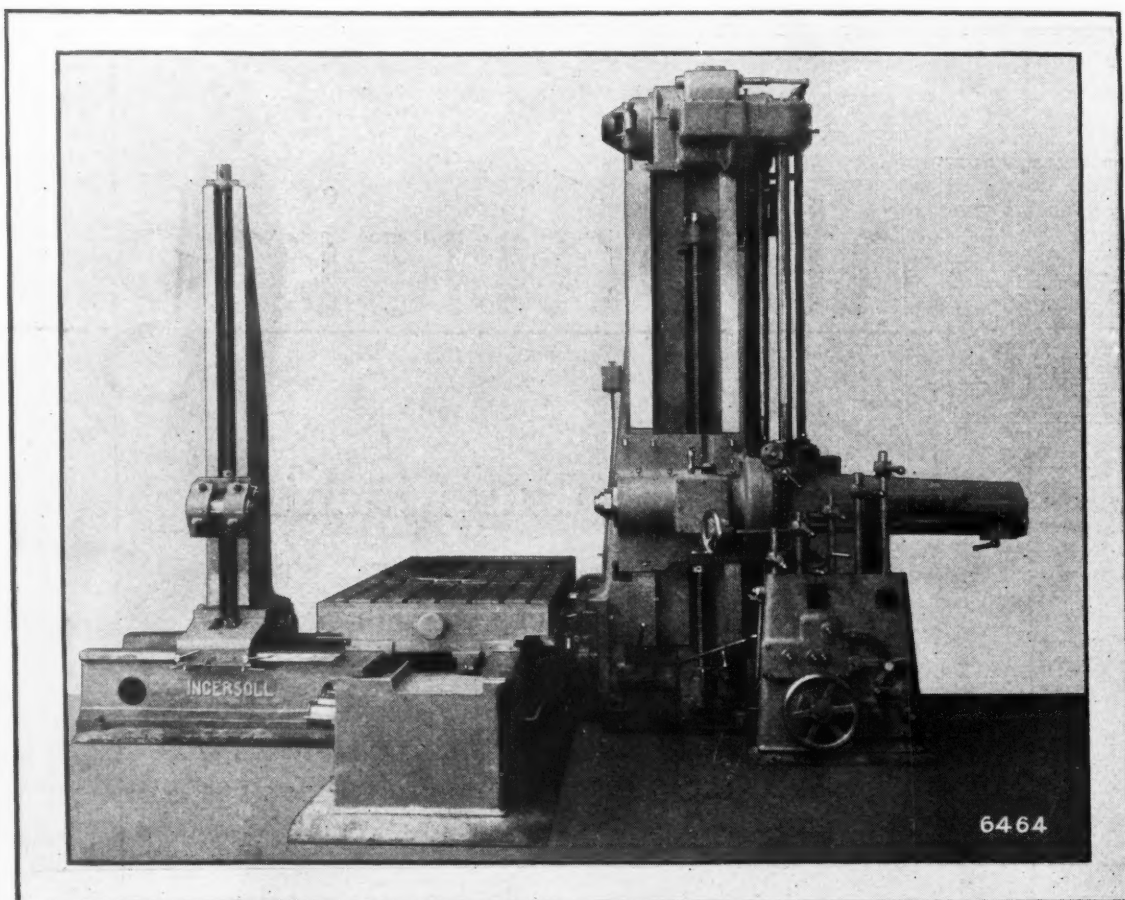
Bear in mind that these machines are new members added to the line, not old models modernized. They are new in every respect and embody all of the features and accuracy found in the latest heavy duty and larger sizes of Kearney & Trecker Motor-in-Base Milling Machines.

These new machines have a range to meet your requirements. And the K & T representative has a story on Values worthy of your investigation.

Kearney & Trecker Corporation

Milwaukee—Wisconsin





Ingersoll

Openside Machines

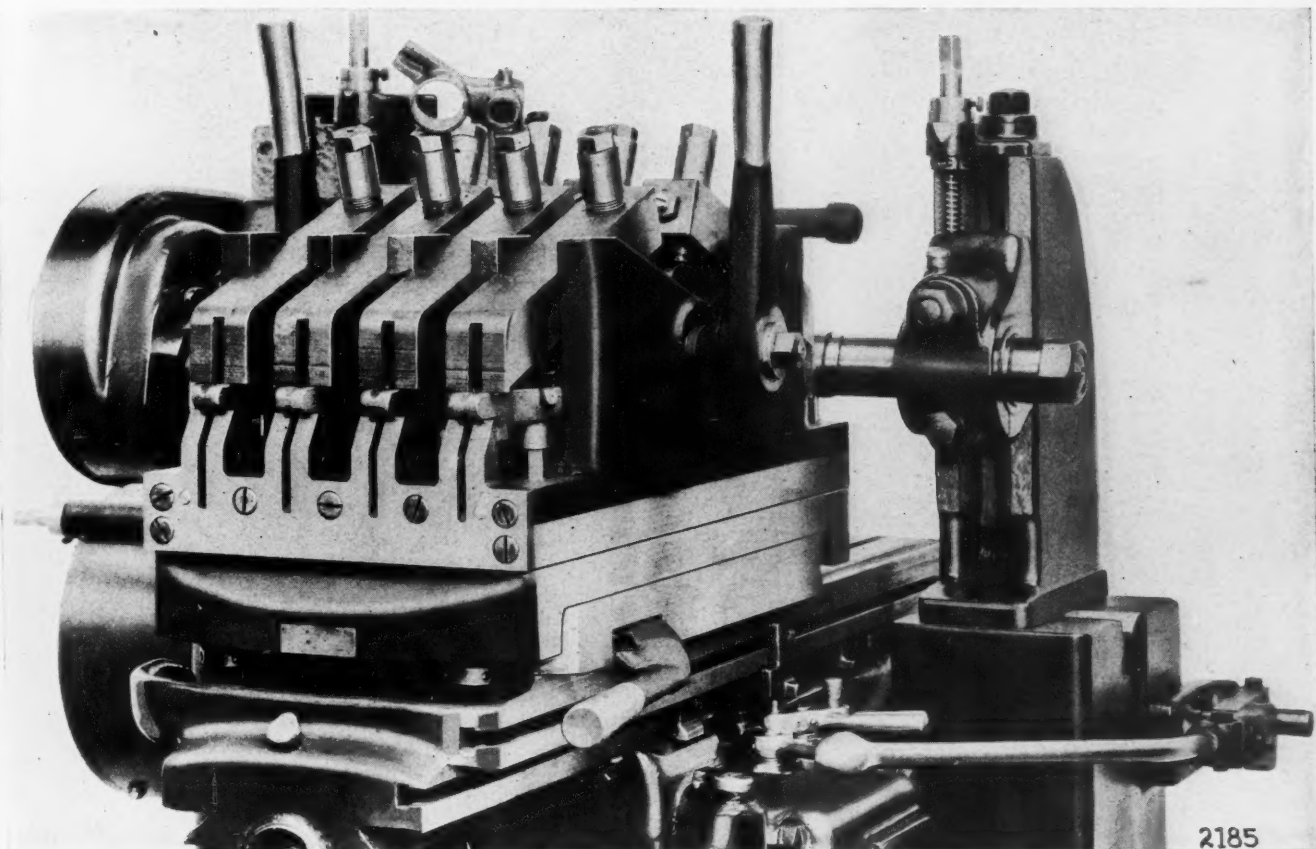
These machines are all built to do heavy, accurate milling, boring and drilling. They have moving tables and stationary housings, allowing a much more rigid construction than is possible in the movable housing type, while the spindle, drive gears, and shafting have ample capacity for heavy milling cuts.

The tools can be supplied with practically any capacity required, but are built in three general sizes, classified by the size of the spindle. The machine above has a 5-inch bar, the other sizes being 7½-inch and 10-inch. The housing, saddle and drive are proportional and are of similar design in the different machines.

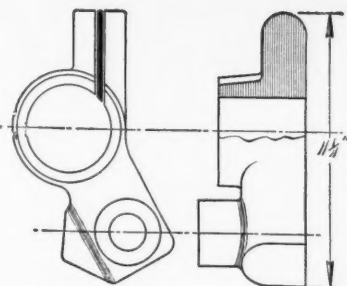
The auxiliary housing, carrying a bar support, can be moved back or removed entirely if desired. The bar on this machine has an extension of 36" and may be raised 6 feet above the table. The controls are conveniently located on the panel at the right, reducing the operating time to a minimum.

The Ingersoll Milling Machine Company
 ROCKFORD, ILL.

Milling Machines and Their Equipment



Patented



2185-Z

Machine—24" Plain Automatic.

Operation—Saw Slot.

Material—Malleable Iron.

Time per Piece—.097 minutes.
540 pieces per hour.

Stock Removed—Saw.

Cutters—4—6 1/2" diameter by
1/8" wide Alternate Tooth
Saws mounted on 1 1/2" dia.
Arbor.

Speed—49 R.P.M.

Feed—4.8" per minute.

AN IDEAL INDEX BASE JOB

When you team a Cincinnati Automatic Miller with the index base method, you get fast production. The slots in these malleable iron brackets are milled using this combination. The fixtures are interesting in that one clamping lever holds four pieces, greatly simplifying the loading operation.

Operators like to run these machines, because they do not have to move from a safe loading position at the front and because the physical effort required of them is reduced to a minimum by automatic control.

The Right Machine for the Job

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI · OHIO · U.S.A.

CINCINNATI MILLERS

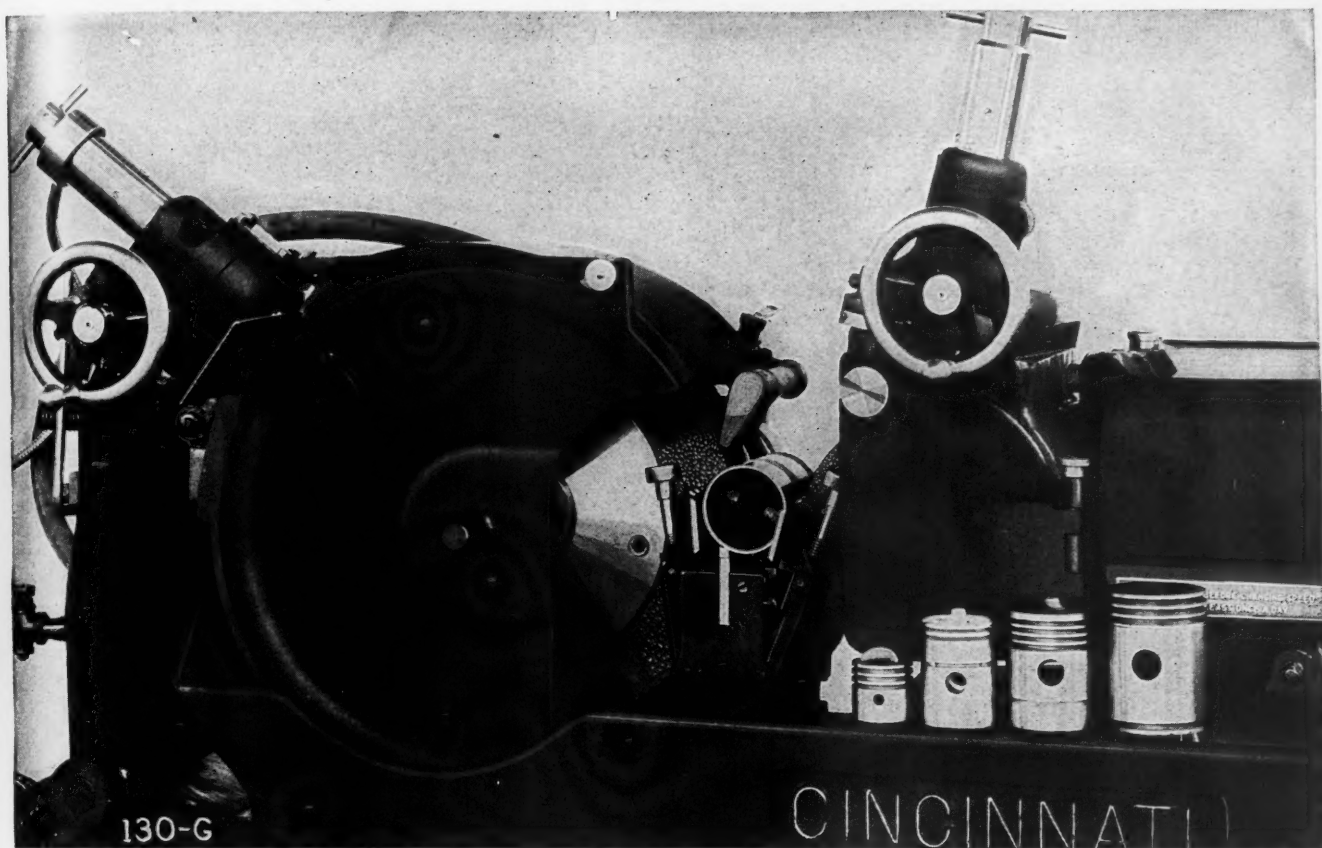


A UNIQUE SERVICE ON GRINDING

Here is where we produce new ideas and new methods on grinding. In our new plant at Cincinnati we are equipped to render prompt and thorough service in improving your present grinding methods and recommending more modern and more productive grinders. Furthermore, we are in the exclusive position of being able to offer you not only the latest type of Plain and Universal Cylindrical Grinders, but also to consider the application of the revolutionary Centerless type of Grinder. Our ideas are gathered from our wide experience in shops large and small. These same ideas are available to you with no obligation.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI, OHIO

CINCINNATI GRINDERS

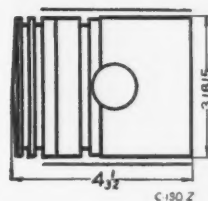


Patented

"THE BEST PISTON WE EVER GROUND"

This is the statement of the chief inspector in one of the largest automobile plants in Detroit.

The illustration shows a set-up for the finished grinding of the pistons. The machine is a Standard No. 2 Machine with straight through work rest and a special spacer to line up the grinding wheel in the center of the wide regulating wheel and also one standard profiling attachment over the grinding wheel. Previous practice in the automobile industry has considered a piston to be satisfactory if ground to limits of .0007 to .0010. This machine has been able to produce finished pistons within a limit of .0002 for roundness and they are held to any predetermined size within the same limit. It is no wonder that Centerless Grinders are more and more being used on the piston job. In grinding the piston, the face of the wheel is dressed to a crown so that the piston will start to grind easily and so that the stock is gradually removed. The pistons revolve before and after the cut.



Name of Part—Automobile Piston.

Material—Cast Iron.

Limits—.0002 for Roundness and Size.

Total Stock Removed—.005.

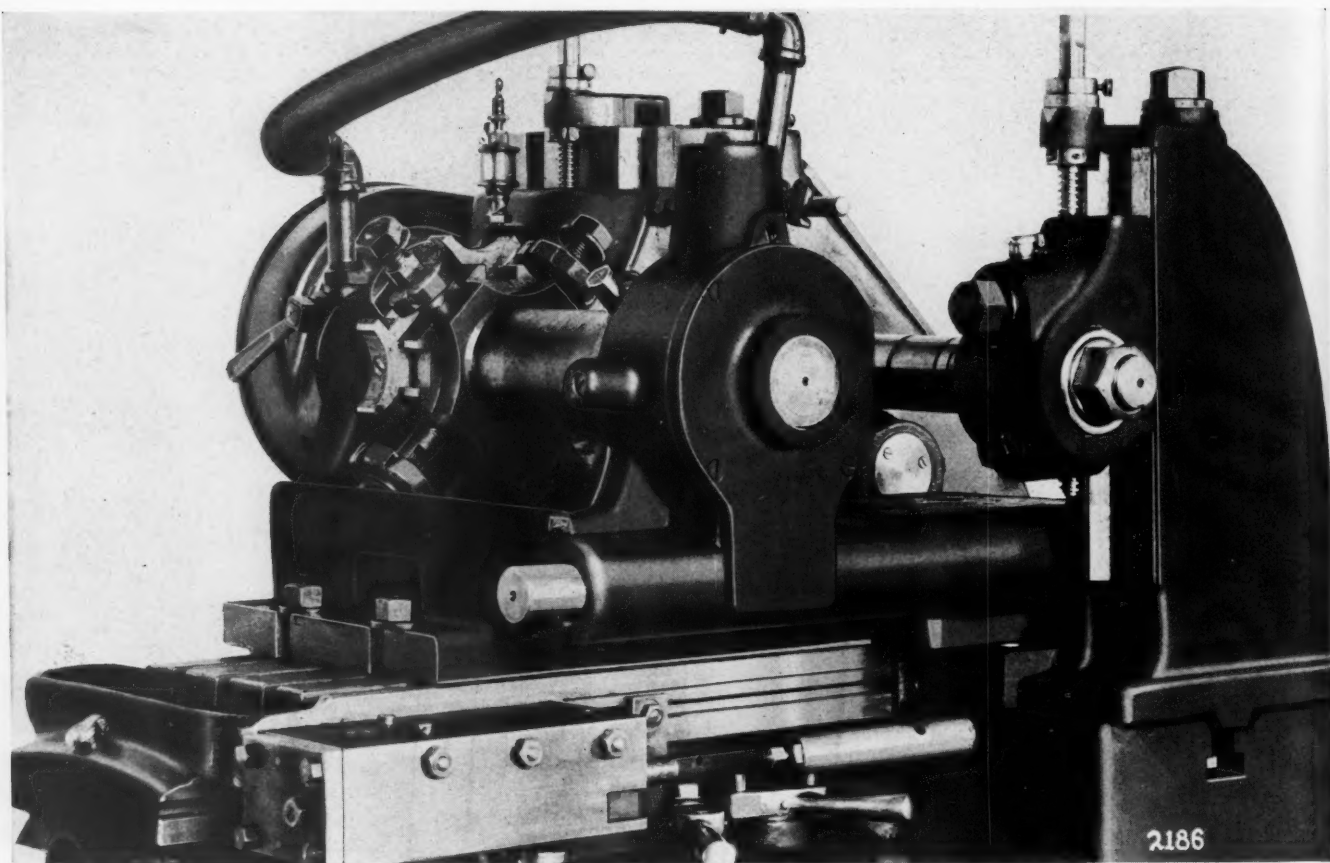
Production—175 per Hour.

Machine—Cincinnati No. 2 Centerless.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI, OHIO

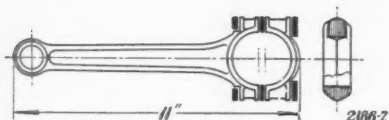
"A New Service with New
Methods of Grinding"

CINCINNATI GRINDERS



Patented

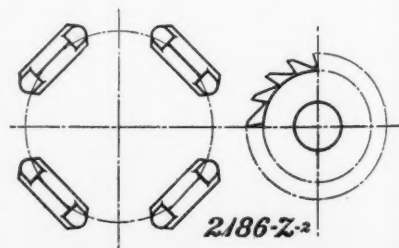
CONNECTING RODS MILLED BY NEW METHOD



Machine—24" Plain Automatic.
Name of Part—Connecting Rod.
Operation—Mill Bolt Bosses and Saw-off Cap.
Material—Drop Forging.
Time per Piece—41 minutes.
Stock Removed— $3/32$ " and from Solid.
Cutters—1— $4\frac{3}{4}$ " diameter Saw and 1— $4\frac{3}{4}$ " diameter and 1— $5\frac{1}{8}$ " diameter Side Mills on $1\frac{1}{2}$ " diameter Arbor.
Speed—62 R.P.M.
Feed— $3\frac{7}{8}$ " per minute.

A good many different types of fixtures and machines have been worked out for the straddle milling and sawing off the cap of connecting rods. Here is a different idea which we believe, for many jobs, beats them all. A special four-station 90 degree automatically indexed fixture carries one rod at each station. (See sketch below.) The fixture is indexed by the forward and return motion of the machine table. A simple gang consisting of two side mills and one saw does the cutting. This particular arrangement has the advantage of low first cost, convenient set up and also what is more important, both portions of the splitting cut are produced by the same saw, giving greater accuracy and a more satisfactory job.

In the foreground is shown a specially constructed load and fire type reverse dog to obtain unusual accuracy when feeding to a required depth.

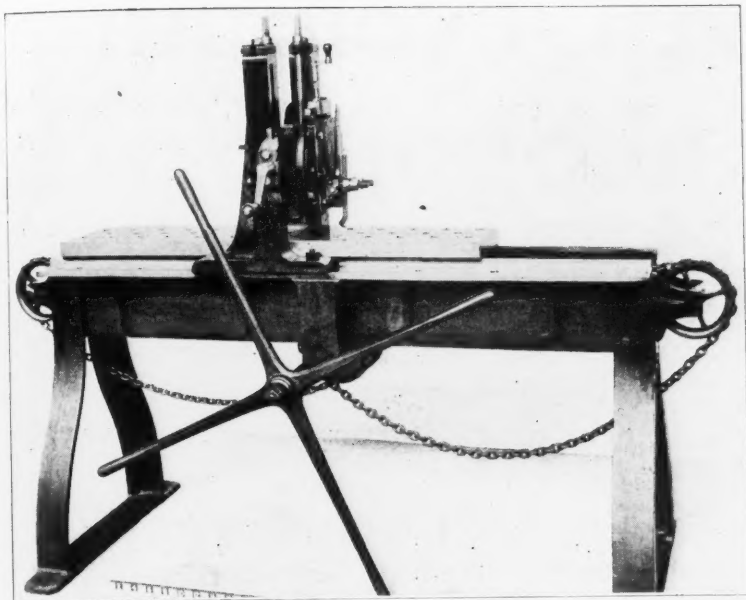


The Right Machine for the Job

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI, OHIO, U.S.A.

CINCINNATI MILLERS



110 YEARS OLD

FILE and chisel marks on the head indicate how this planer was made.

The table is hand-operated by a chain; it slides on one inverted V and one narrow flat guide. The cross-rail is raised and lowered by two screws which, however, are not interconnected.

The saddle is hand-traversed on the rail by a screw. There is also a screw in the head for moving the tool-slide up and down. The head may be swiveled for angular planing.

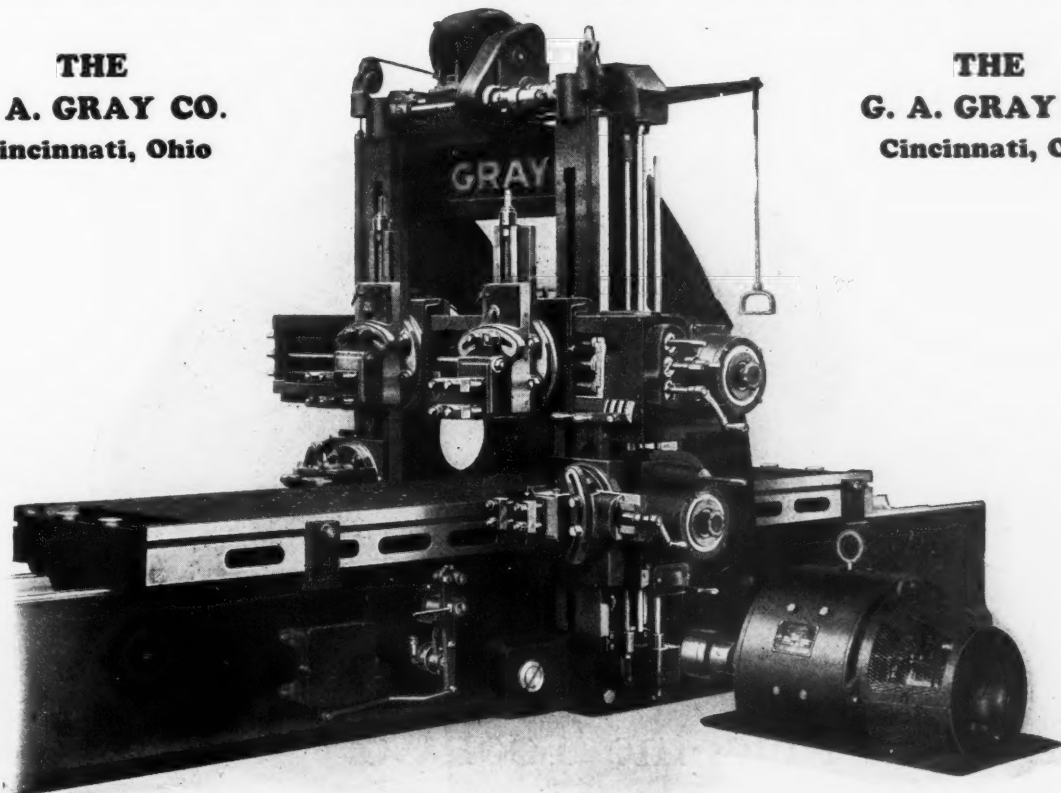
The cutting tool is held in a hinged clamp which allows it to lift on the return stroke.

ABOVE is shown the *oldest* metal planer in existence. It was made in 1817 by Richard Roberts, and is preserved in the Science Museum, South Kensington, London, England.

BELOW is shown the *Gray Maximum Service Planer*,—the most up-to-date product in the planer field. It embodies all the features which the ideal planer should possess, and each one is in its simplest and most efficient form. We have been building planers since 1882 and during these forty-five years have naturally gained wonderful experience covering both planer requirements and the most efficient methods of planer production.

Our new shop is the largest plant in the world devoted exclusively to the manufacture of Planers—Openside and Double-Housing. Many sizes—but only one quality.

**THE
G. A. GRAY CO.**
Cincinnati, Ohio



**THE
G. A. GRAY CO.**
Cincinnati, Ohio

A Distinctive Development for Railroad Shop Work

THE design of the Bullard "Spiral Drive" Type Vertical Turret Lathe incorporates all the good features of the engine lathe, the horizontal turret lathe and the vertical boring and turning mill.

There are, however, a number of distinctive elements in its makeup that further output and accuracy.

Its tooling requirements are simple in the extreme and adjustments and operation call for minimum attention.

In many shops, it is kept steadily producing standard parts; in others it is considered a master jobbing tool, handling variety chucked parts requiring boring, turning, facing, grooving, threading, and like operations.

On the opposite page we show the Bullard machining valve chamber bushings, former boring mill time 4 hours.

The main and side heads, set at right angles to each other, complete the boring and turning operations simultaneously. In the shops of a large eastern road they produced a finished bushing from the rough casting in 1 hour.

Bullard Engineers have a long list of "Spiral Drive" Type Vertical Turret Lathe accomplishments. Parts similar to the ones that have caused you trouble are in this list. Send them prints, samples or sketches of these parts for a solution to your problem.



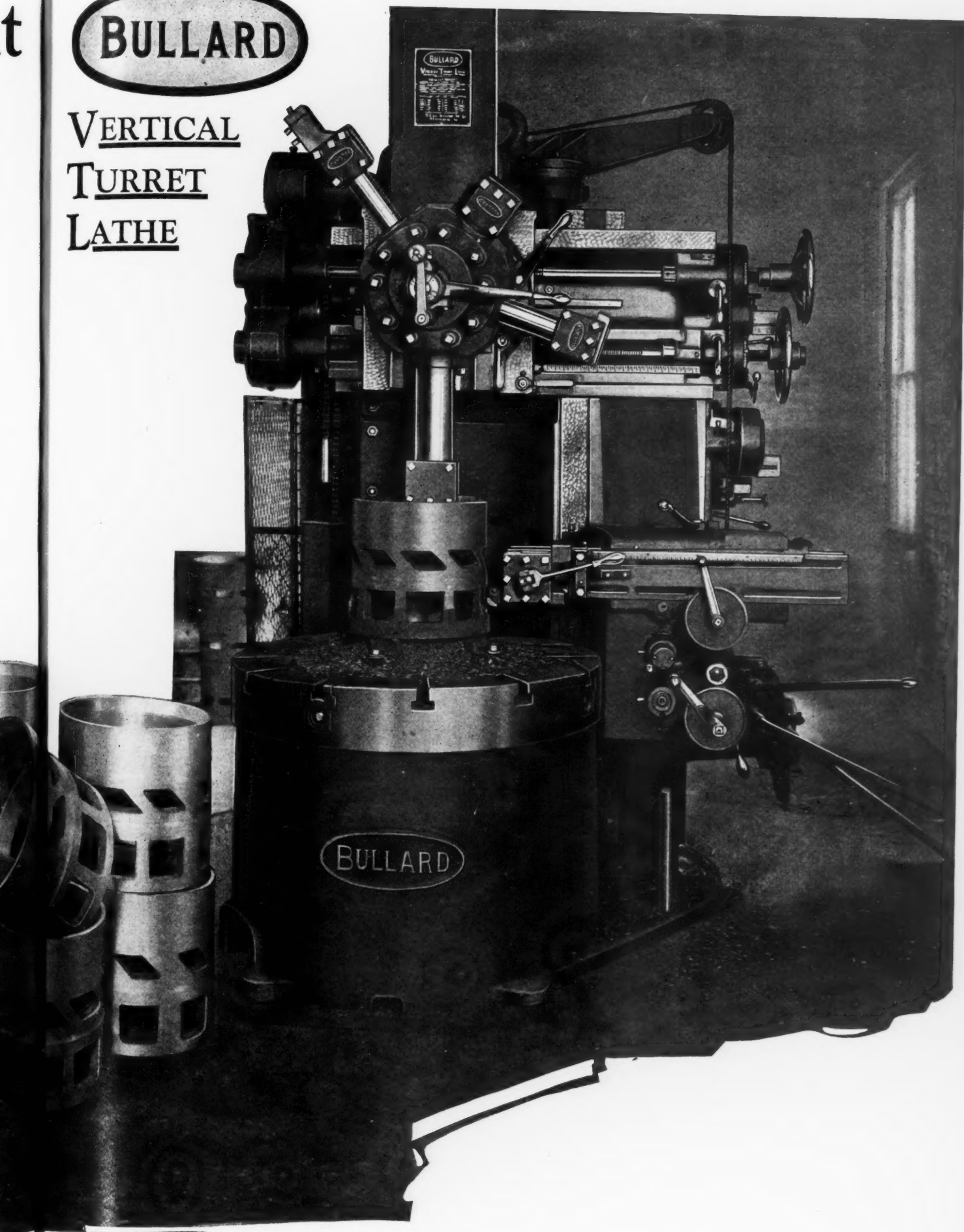
The Bullard Machine Tool Co.
Bridgeport, Conn.



t

BULLARD

VERTICAL
TURRET
LATHE



BRENT BUYS



Brent and Hoyt discuss Power Rapid Traverse to the Head

Brent — "I'm going to tell you frankly, Hoyt, that I'm not sold on power rapid traverse to the head. I don't think we need it."

Hoyt — "Mr. Brent, power rapid traverse is one of the greatest time and energy savers that has ever been put on a radial drill. This thing of cranking the head along the arm is slow — it's a tiresome job. Radial drill operations are short.

The SUPER

THE CINCINNATI BICKFORD TOOL

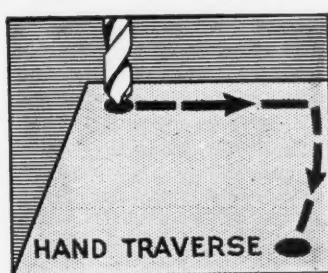
RADIAL DRILLS

The head is going back and forth on the arm all day long. So why waste the operator's time and energy in this fashion? Make a man's job easier and he produces more. That's why we put power rapid traverse on the SUPER-SERVICE Radial—power rapid traverse *that cuts the head moving time in half.*

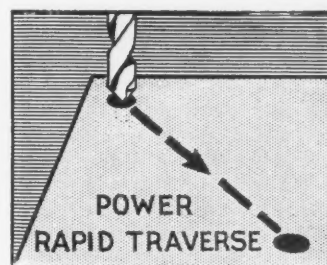
"Here's another short cut. The operator on the SUPER-SERVICE traverses the head and swings the arm at the *same time.*"

Brent — "I don't get your point."

Hoyt — "Perhaps these sketches will make it clear."



"One sketch shows the path of the drill between two holes where the head is traversed by hand—the other, where power rapid traverse is used. With hand traverse, two movements are required. First, the head is moved



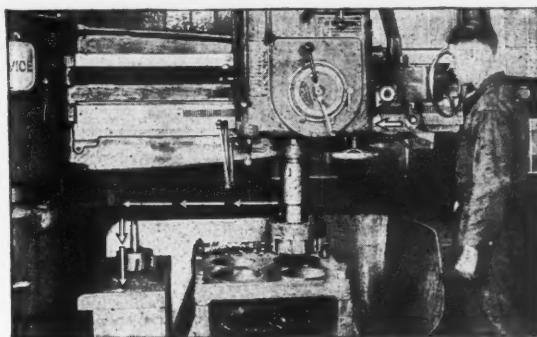
on the arm, then, the arm is swung or vice-versa. With power rapid traverse, the head is traversed while the arm is swinging—the drill travels in a straight line. Have I made that clear?"

Brent — "Yes."

Hoyt — "Now another thing—you use heavy pipe taps and cutter heads, don't you?"

Brent — "Yes, we use a lot of heavy tools."

Hoyt — "Then here's something the men in your shop will appreciate. Your operators wouldn't have to lift and struggle to get heavy tools on and off the spindle if you had SUPER-SERVICE Radials. Look at the arrangement in this photograph."



"There's a bench or tool stand next to the column. Put your heavy tools on it. Use your power rapid traverse as you would the traversing motor on one of your cranes. Simple, isn't it? Did you —"

Brent — (Interrupting) "Hoyt you've certainly swung me around. That *power rapid traverse* of yours is one of the best things I've ever seen on a radial drill."

[In the next issue Brent and Hoyt
discuss Centralized Control]

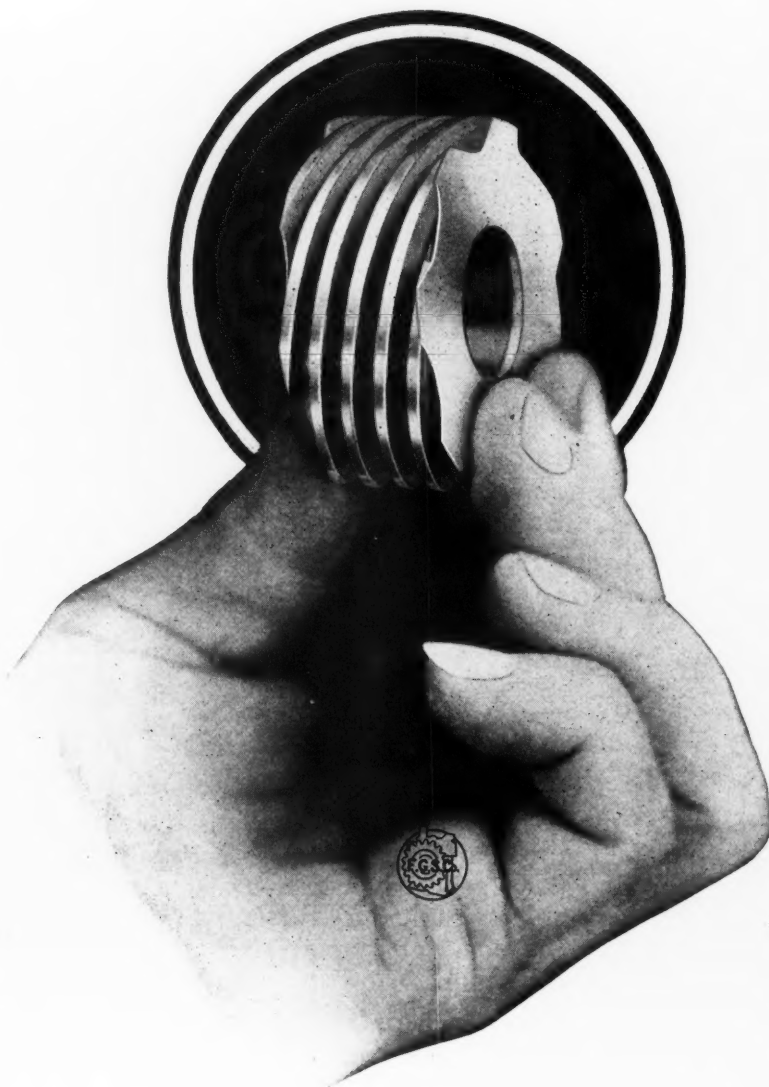
SERVICE Radial

COMPANY, OAKLEY, CINCINNATI, OHIO.

Multiple-Threaded Worms

*Can be Accurately
and Economically
Produced on the*

New Model Thread Generator



Provided:

that you have a large quantity of worms to cut.

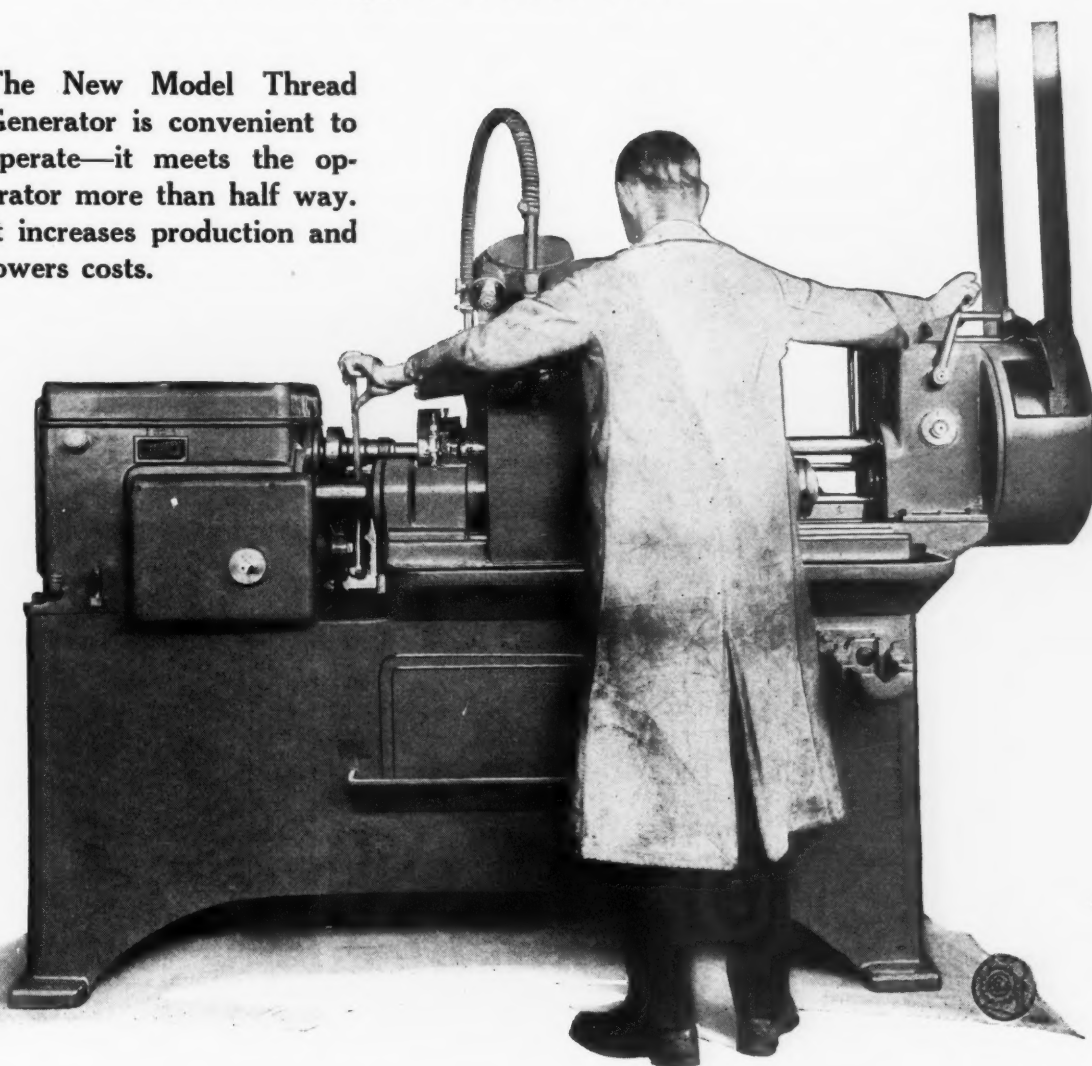
Every manufacturer of worms cannot use the New Model Thread Generator to profitable advantage, because, in order to prove profitable, this machine must be kept busy—and—it takes a large number of worms to keep it going.

But, to those manufacturers who have large quantities of threaded work to cut, this High-production machine has proved a profitable investment.

It is nothing unusual to find this machine cutting costs in half, and producing a better product into the bargain.

Estimates on your work will not obligate you, and again they may prove to be the means of increasing your profits. Ask for a copy of booklet No. 9.

The New Model Thread Generator is convenient to operate—it meets the operator more than half way. It increases production and lowers costs.



THE FELLOWS GEAR SHAPER COMPANY

Head Office and Works: 78 River Street, Springfield, Vt., U. S. A.

Branch Office: 651 Book Bldg., Detroit, Mich.

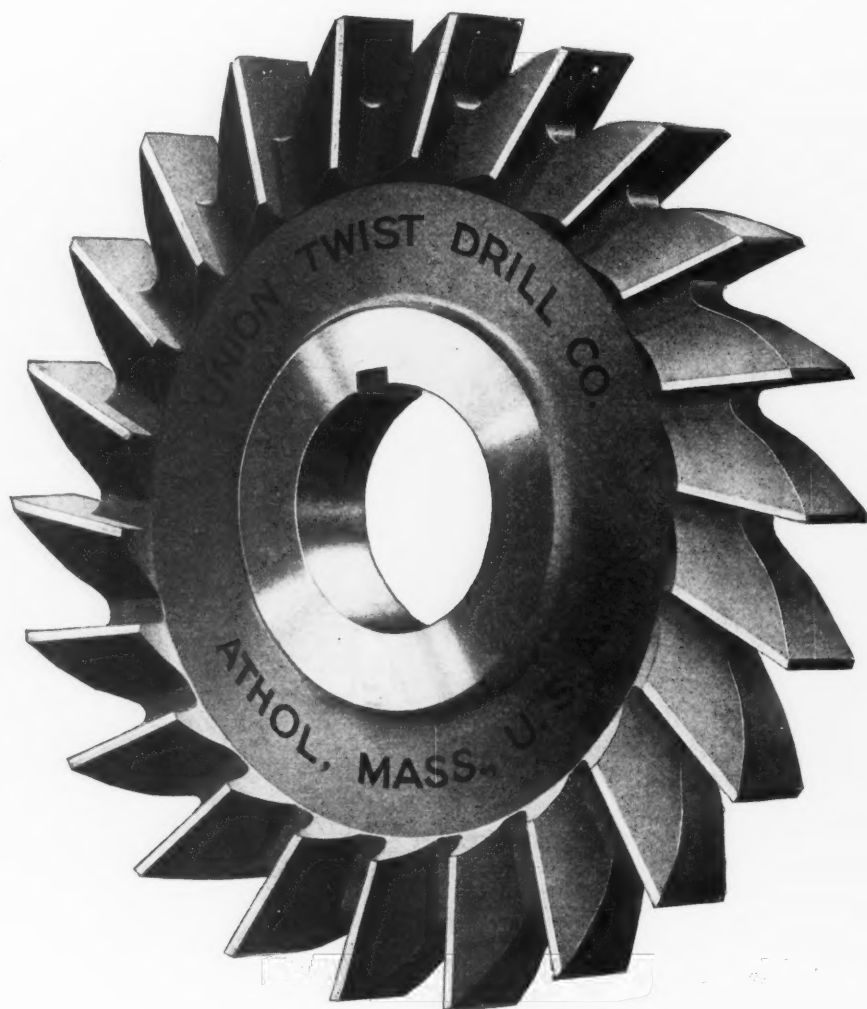
FOREIGN AGENTS—Alfred Herbert, Coventry, England—Great Britain; Alfred Herbert, Sydney—Australia; Societe Anonyme Alfred Herbert, Paris—France and Spain; Societa Anonima Italiana Alfred Herbert, Milan—Italy; Societe Anonyme Belge Alfred Herbert, Brussels—Belgium—and Holland; Bohm & Bormann, Berlin—Germany, Czecho-

Slovakia and Austria; Aktiebolaget A. Bonthron, Stockholm—Sweden, Finland and Norway; American Machinery Import Co., Zurich—Switzerland.

PACIFIC COAST REPRESENTATIVE—Louis G. Henes, San Francisco and Los Angeles—California, Arizona and Nevada.

Union Twist Drill Co.

ATHOL, MASS.



*They represent the best that
can be produced*

A Complete line of Milling Cutters,
Twist Drills, Hobs, Reamers, Taps and
Dies—Carried in Stock.

Specials made to order.

NEW YORK
62 Reade Street

CHICAGO
11 South Clinton Street



Exhibiting at
**NATIONAL MACHINE
TOOL BUILDERS ASS'N
EXPOSITION**

Cleveland - Sept. 19-23
SPACE A8

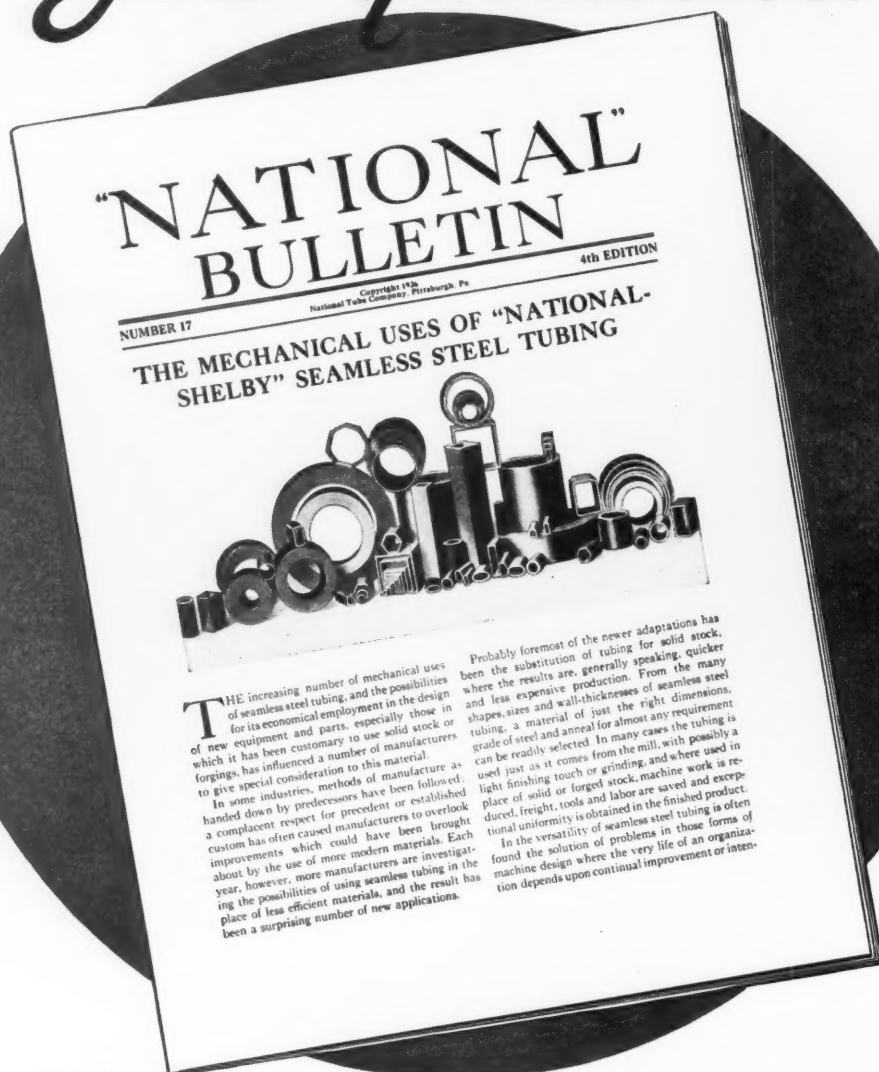
Time Waste Causes the Greatest Loss in Industry.

Material handling machinery best simplifies this problem when equipped with New Departure Ball Bearings.

Data on conveyors, hoists, elevators, trolleys, cranes, etc. furnished without obligation by the Engineering Department of the New Departure Manufacturing Company, Bristol, Connecticut.

New Departure
Quality
Ball Bearings

Perhaps this will answer your questions!



MANY times in the past, and, no doubt, at the present there are questions in your mind as to the feasibility of using seamless tubing to advantage in your work. Such questions as the strength of seamless tubing; its adaptability for certain uses; its cost-saving advantages; the different shapes and sizes in which it comes; its wall-thicknesses; different grades of steel and anneals; will it save time and labor; will it meet this or that requirement? The above bulletin will answer these and many other questions to good advantage. Perhaps it will ease your mind on some long studied problem. We feel quite confident that the information compiled will be of great interest and be appreciated by you. Send for a copy.

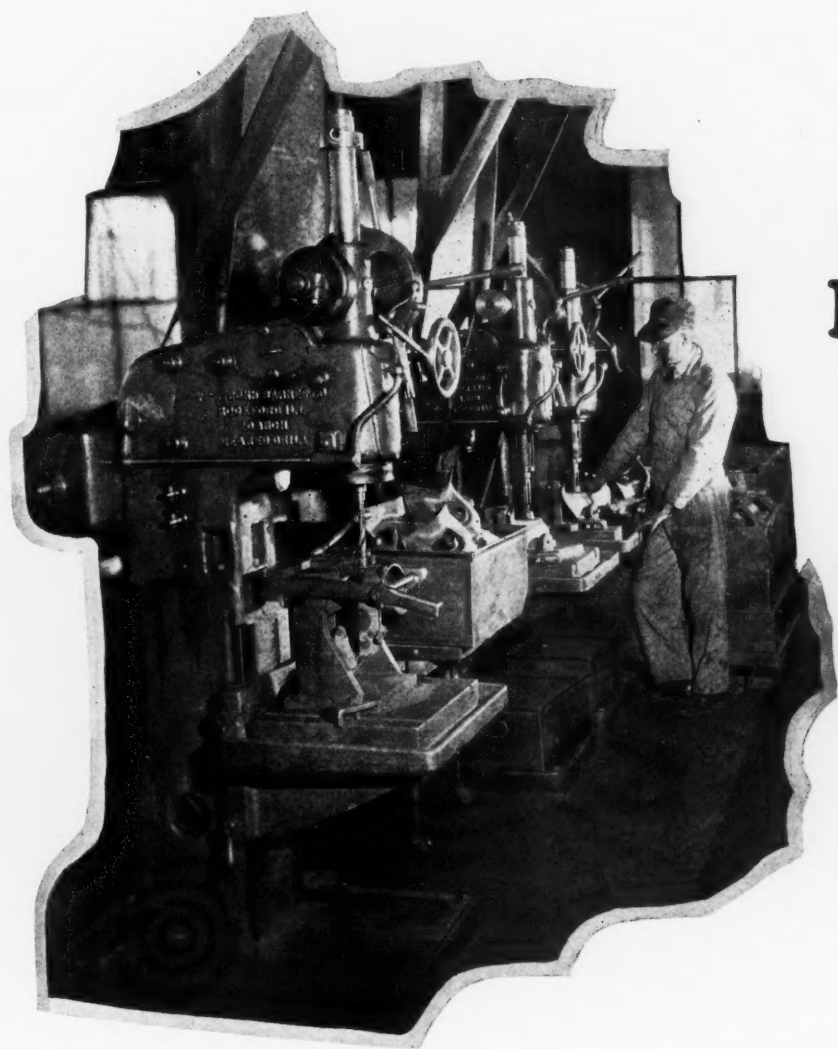
Remember! "NATIONAL-SHELBY" Seamless Tubing is made by the largest manufacturer of tubular products in the world.

NATIONAL TUBE COMPANY GENERAL SALES OFFICES: **PITTSBURGH, PA.**
FRICK BUILDING

Please send Bulletin No.17-The Mechanical Uses of "NATIONAL-SHELBY" Seamless Steel Tubing-to

Name _____

Address _____



**Increasing
Production
100%
on
BARNES
DRILLS**

TWO operators drill and ream 1400 pieces per day of nine hours on this battery of three BARNES No. 320 Single Purpose 20-inch Production Drills. This is 100% more production than was obtained on the old equipment which our machines replaced.

The piece being machined is the Crank Housing and Power Leg Bracket of the Maytag washing machine, made by the Maytag Company, Newton, Ia.

May we tell you how Barnes Drills will increase your production?



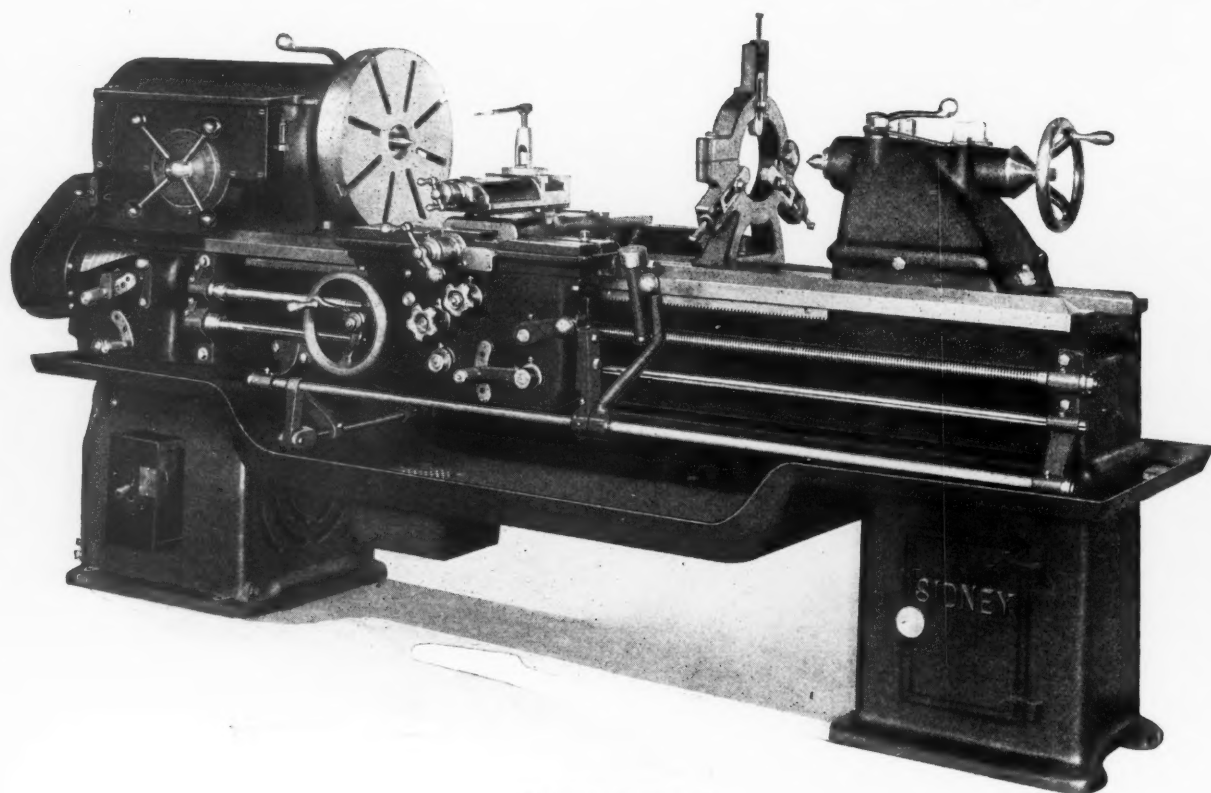
ESTABLISHED 1872

W.F. and John Barnes Co.

ROCKFORD, ILLINOIS



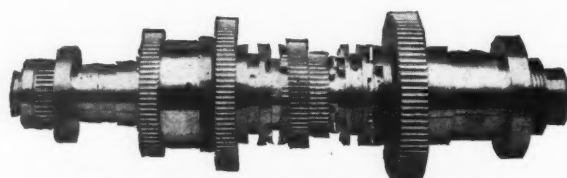
Lathes have set the pace



(PATENTS PENDING)

Spindle speed changes are made instantly from operator's working position—Just reach over with left hand and get the desired spindle speed instantly—There is no other lathe made on which this can be done—by the use of one single lever.

Eight
Speeds,
One
Control
Lever



Showing Main Spindle Assembly.
Tapered Bronze Spindle Bearings.

All gears and clutches secured by splines cut from solid.

*This lathe will be shown at
The National Machine Tool Builders' Exposition
Sept 19-23—Booth No. 107*

Gears
and
Clutches
150,000 Lbs.
Tensile Strength
—
Heat treated
and
Ground.
—

THE SIDNEY MACHINE TOOL CO., SIDNEY, OHIO
BUILDERS OF GOOD MACHINERY SINCE 1904

The New
MORSE

Forged Type
High Speed
Drill

Increased production 53% in
one plant.

An average of 300 holes
per grind was maintained—
showing a drill that stays good
to the last inch.

*We know it can
Help YOU*

MORSE
TWIST DRILL & MACHINE CO.
NEW BEDFORD, MASS., U.S.A.

Morse High Speed and Carbon Tools Sold by
Reliable Dealers Everywhere



3 *against* 6



another Sellers Distinction

THE drive for Sellers Planers consists of only three gears—two herringbone and one spiral.

Compare this with the cumbersome and less efficient six-gear drive of the bull wheel type.

The Sellers three-gear drive has many advantages. These are some of the most important:—

1. There is 50% less opportunity for wear.
2. The combination of herringbone at the motor and Sellers spiral for the planer table accounts for the absence of chatter marks on the work.
3. This combination of spiral and herringbone develops a steady continuous pressure in marked contrast to the intermittent impacts of a spur gear train.

But the real answer, the final reason this type of drive is so successful—as developed by Sellers—is because Sellers have known how to design and make an efficient spiral gear drive for more than half a century.

That explains why so many Sellers Planers are still efficient tools after twenty-five years' continuous work.

Think over these facts and ask for more, before you buy a new planer.

Sellers Planers built in sizes 36" to 192"

WILLIAM SELLERS & CO. INCORPORATED

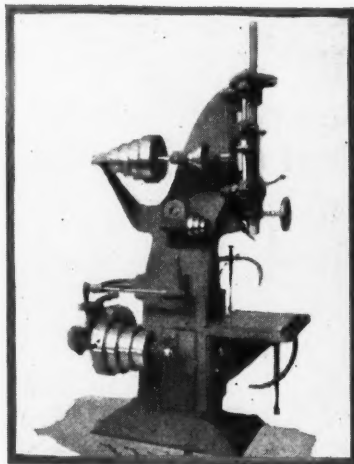
Philadelphia, U.S.A.

Builders of Machine Tools Since

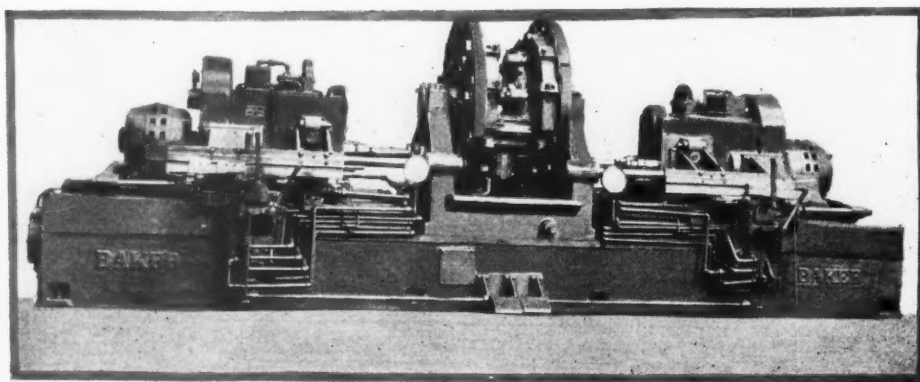
1876

From our long experience in specializing on drilling, boring and keyseating equipment, we have data available on a multitude of different machining operations involving this type of equipment. This experience is at the disposal of any organization whose product requires such equipment.

Send us your blueprints and let us show you what results BAKER equipment can produce for you.



An Early Baker Machine, the Pioneer Heavy Duty Drill.



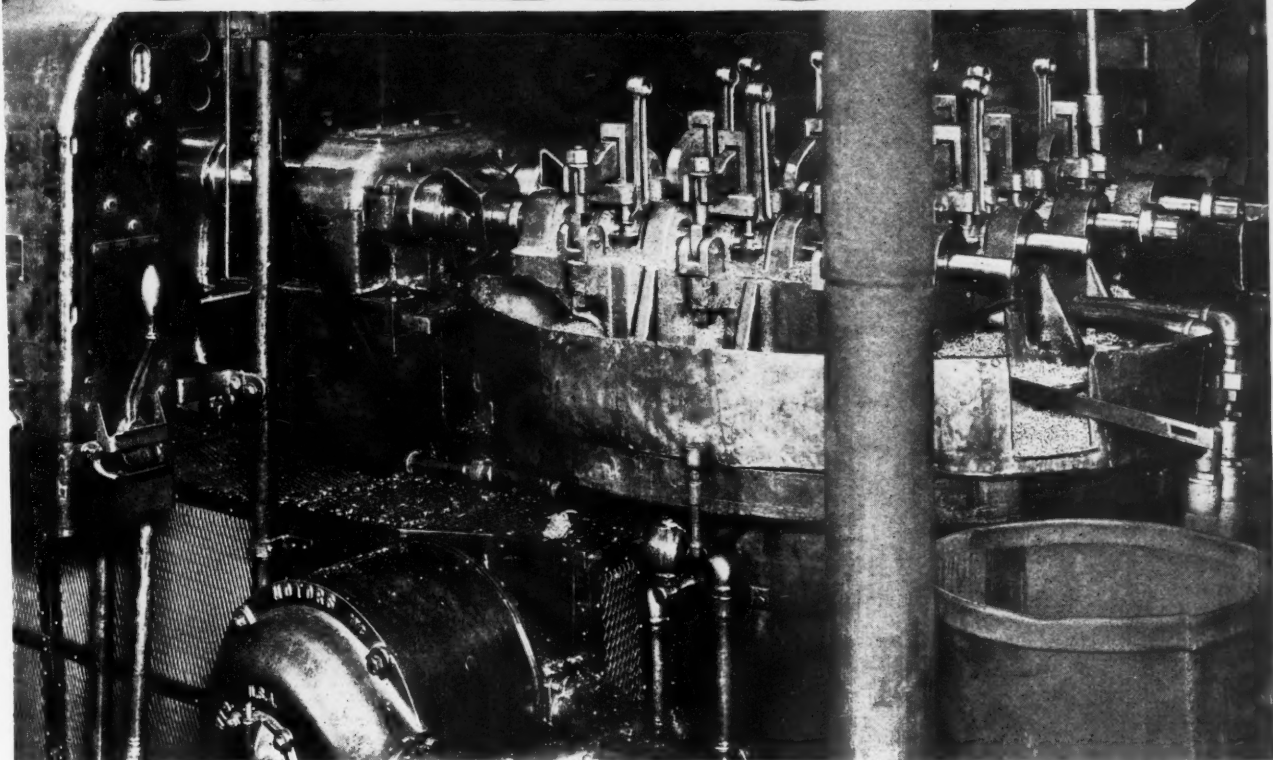
A 1927 Baker development, self-contained motor drive, hydraulic feed, alloy steel heat treated gears, etc., symbolizing our aim to keep pace with ever changing and increasing production requirements and machine shop practice.

Baker Brothers Inc.

Toledo, Ohio

*Builders of Drilling, Boring, Tapping, Keyseating and
Slotting Equipment*

COLBURN

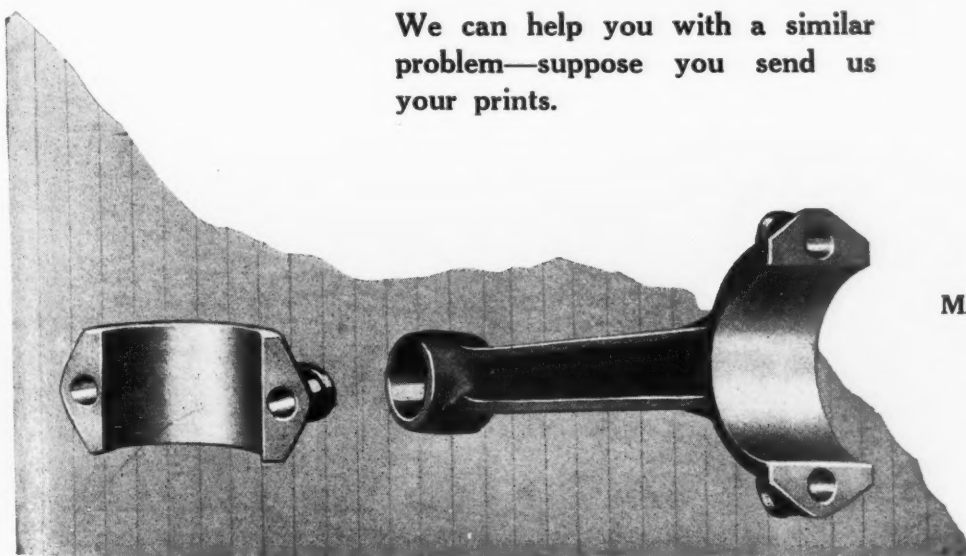


Production—83 Rods an Hour

Boring $2 \frac{7}{16}$ -in. holes in 6 connecting rods every $4 \frac{1}{3}$ minutes is real production.

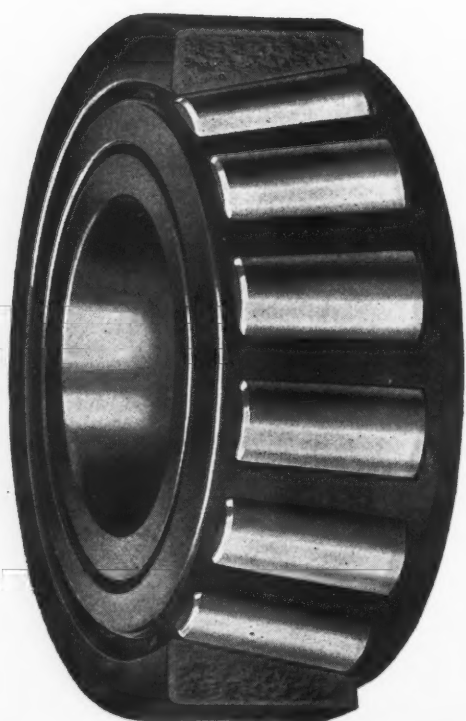
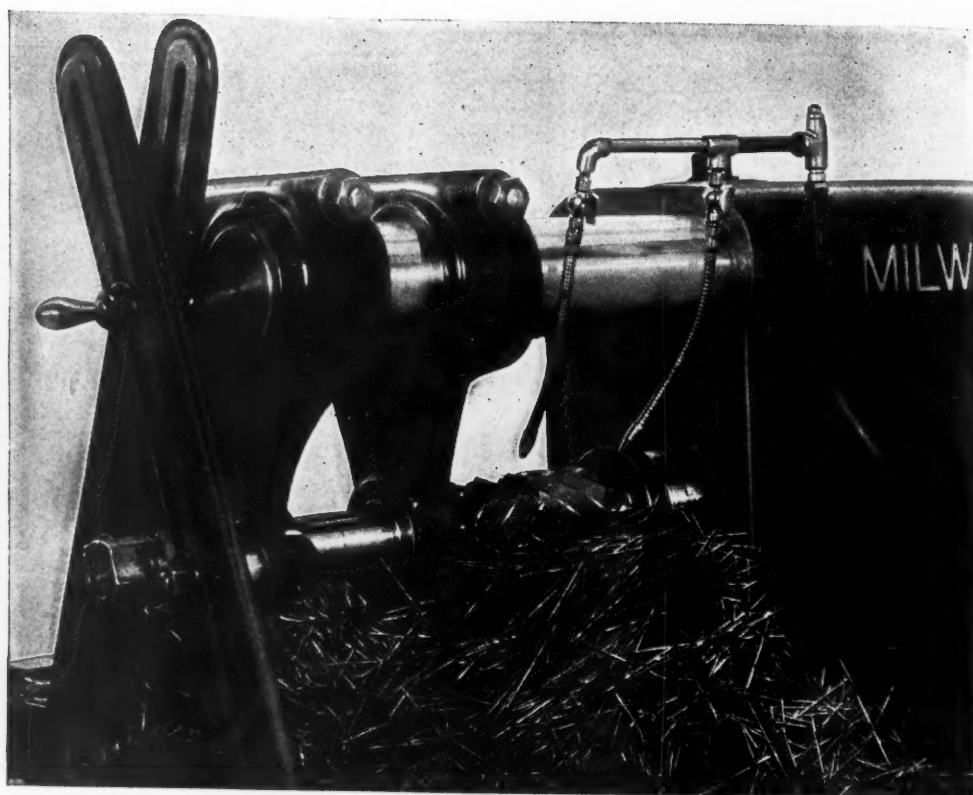
That's what one prominent manufacturer of a popular six is doing on a COLBURN No. 60 Drill Press.

We can help you with a similar problem—suppose you send us your prints.



CONSOLIDATED
MACHINE TOOL CORP.
OF AMERICA

Rochester, N. Y.



TIMKEN *Tapered Roller*

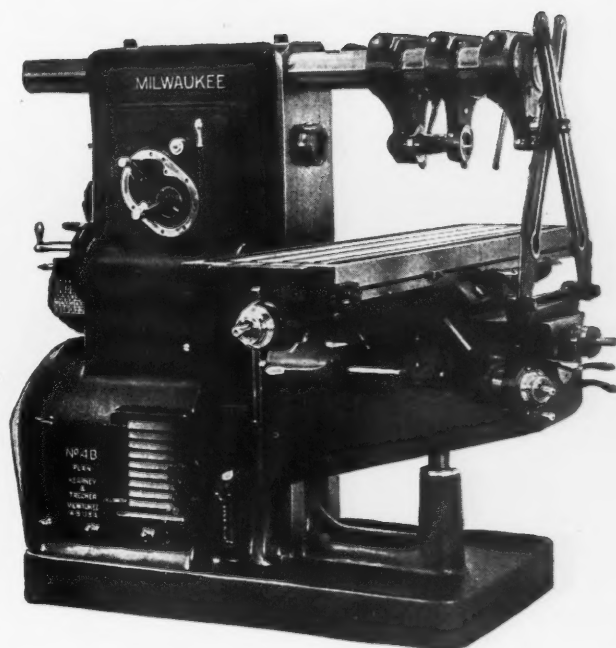
Running the Gauntlet for Five Years

For more than five years they tested Timken Bearings. They found them capable of producing betterments never before attainable. Only then did Kearney & Trecker adopt Timken Tapered Roller Bearings. The showing made by Timken Tapered Roller Bearings throughout the drive led to their adoption on the spindle itself. Acceptance by such engineering institutions as Kearney & Trecker underlies the eager acceptance of Timken-equipped machinery throughout industry.

Timken friction elimination, which reduces wear and brings all possible power to the cutters, does not alone account for the prompt, widespread recognition of Timken Tapered Roller Bearings. New possibilities in *basic design* are introduced by the higher radial, thrust and shock capacity of Timken tapered construction, *POSITIVELY ALIGNED ROLLS* and electric steel.

The extra load capacity of Timkens permits more compact mountings, reduced overhang and smaller clearances. The results are increased rigidity and endurance—fast, precision output throughout a far longer life. The most consistent high-production, low-cost records in industry are being established by Timken users.

THE TIMKEN ROLLER BEARING CO.
C A N T O N , O H I O



BEARINGS

WEN
ZLL

Rugged

Efficient ~ Power-Saving

MANUFACTURERS
of **PARABOLIC**
MILLING CUTTERS
and **7/16** DRILLS

PARABOLIC Milling Cutters of the Heavy Duty type are truly production tools. Yet the ease with which they cut is a saving both of power and of the machine on which they are used.



*Dealers
Everywhere*

B R A N C H E S

NEW YORK, N. Y.
110-116 W. Broadway

PHILADELPHIA, PA.
43 North Sixth Street

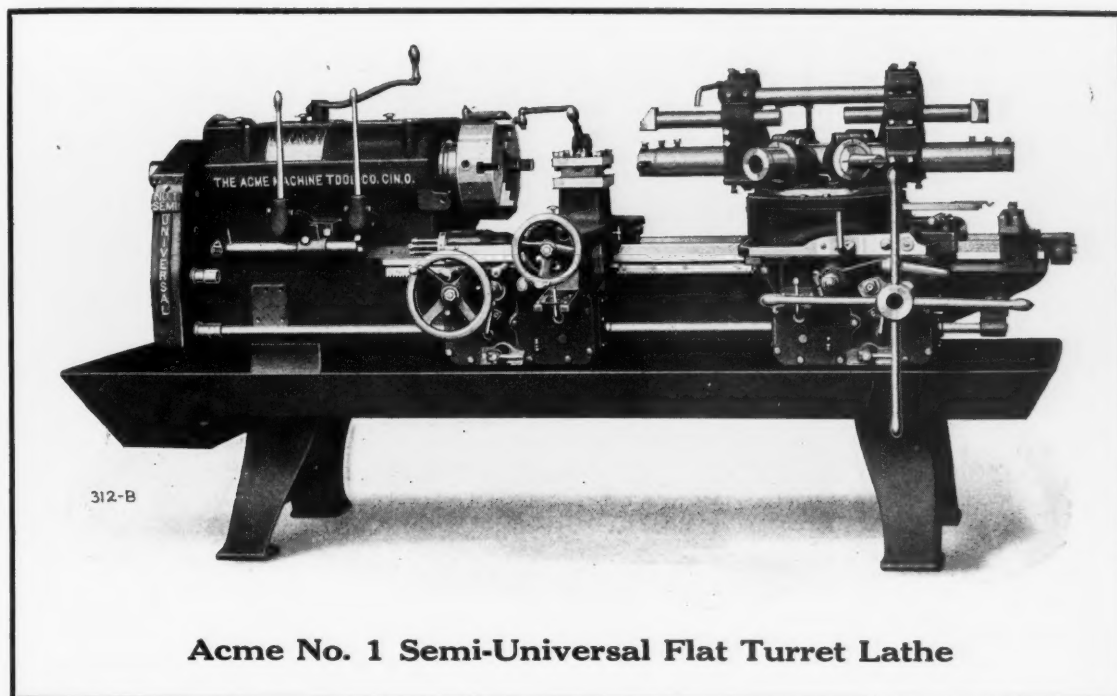
CHICAGO, ILL.
26 S. Jefferson Street

SYRACUSE, N. Y.
107 Gifford Street

BUFFALO, N. Y.
76 Pearl Street

TWIST DRILLS - REAMERS - HOBS - MILLING CUTTERS - SPECIAL TOOLS

NATIONAL
TWIST DRILL AND TOOL COMPANY
DETROIT, U. S. A.



Acme No. 1 Semi-Universal Flat Turret Lathe

Acme Duo Control Flat Turret Lathes Reduce Costs on Bar and Chucking Work

*Let us send you
some production
figures and go over
your own problems
with you.*



The exceptional operating convenience of Acme Duo Control Lathes, together with their simple and economical tooling, enables them to show very attractive cost figures on bar and chucking work.

Side and turret carriage aprons are independent and all 12 feeds for each are in the apron. The 12 spindle speeds are controlled by a lever comfortably accessible to the operator's left hand. Chasing attachment may be used with either side or turret carriage.

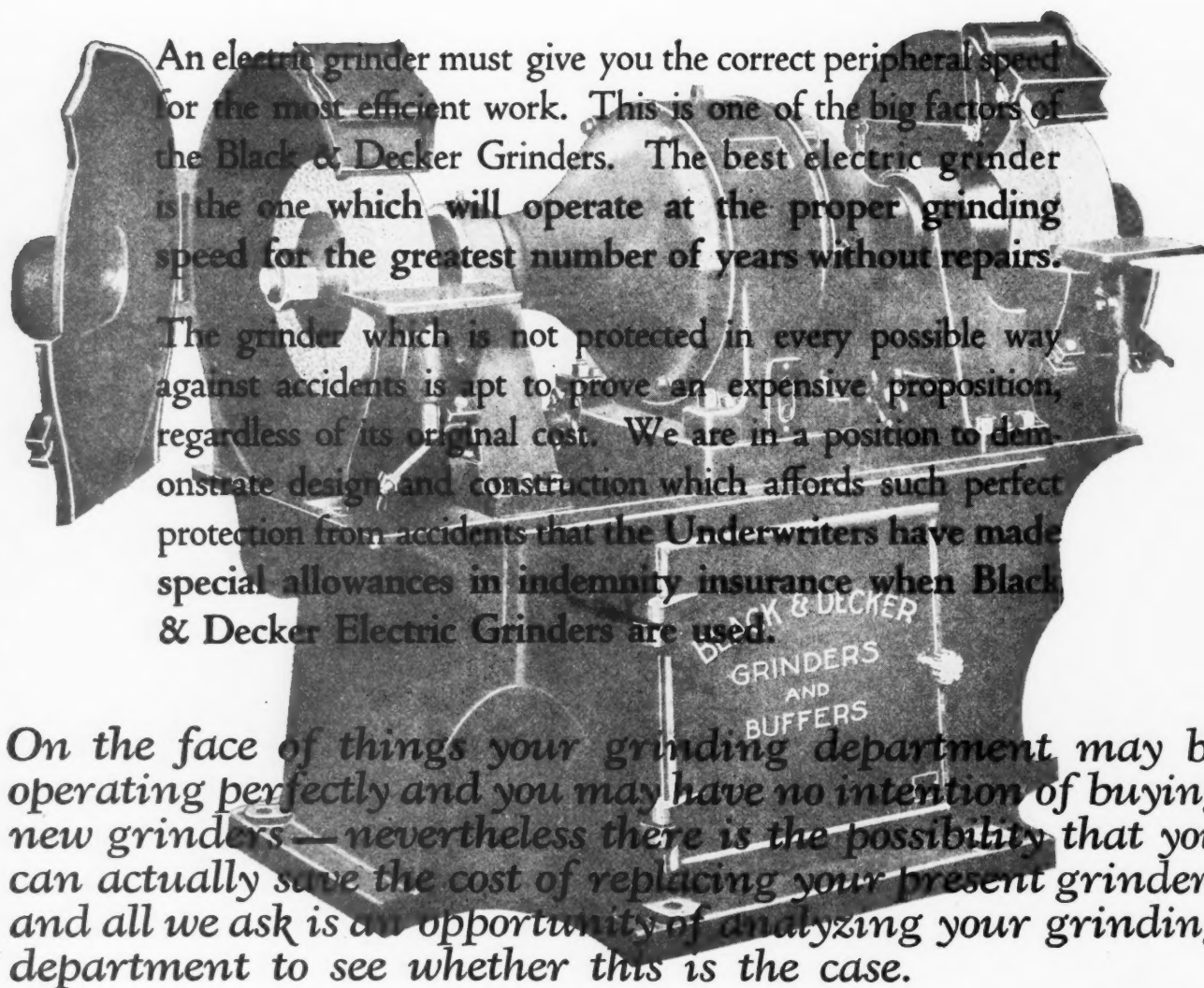
Full Universal models have cross sliding turret—Semi-Universal model is built for average diameter boring and facing operations which do not require this feature.

The speed, the capacity, and the economy of Acme Duo Control Flat Turret Lathes effect such substantial savings as to command interested attention wherever bar and chucking operations are to be done.

THE ACME MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

Agents in all leading cities in this country and abroad

The Wise Executive Buys Quality —Not Price Alone

An electric grinder must give you the correct peripheral speed for the most efficient work. This is one of the big factors of the Black & Decker Grinders. The best electric grinder is the one which will operate at the proper grinding speed for the greatest number of years without repairs.

The grinder which is not protected in every possible way against accidents is apt to prove an expensive proposition, regardless of its original cost. We are in a position to demonstrate design and construction which affords such perfect protection from accidents that the Underwriters have made special allowances in indemnity insurance when Black & Decker Electric Grinders are used.

On the face of things your grinding department may be operating perfectly and you may have no intention of buying new grinders — nevertheless there is the possibility that you can actually save the cost of replacing your present grinders and all we ask is an opportunity of analyzing your grinding department to see whether this is the case.

**THERE IS NO OBLIGATION—
MERELY DROP US A LINE**



Carried in Stock by the Leading Mill Supply Jobbers

The BLACK & DECKER MFG. CO.

TOWSON, MD., U. S. A.

Black & Decker Mfg. Co., Limited, Toronto, Ontario

Black & Decker, Limited, Slough, Bucks, England

Branch Offices with Service Stations in

BOSTON	NEW YORK	OAKLAND, CAL.	ATLANTA	DETROIT	BALTIMORE	KANSAS CITY	LOS ANGELES
BUFFALO	PHILADELPHIA	ST. LOUIS	DALLAS	CHICAGO	MINNEAPOLIS	CLEVELAND	SEATTLE



*Superior Ball
and Roller
Bearings*

The Cost of Anti-friction Bearings

Ball and roller bearings correctly placed, carefully chosen, quickly pay for themselves. Our Engineering Department is ready to cooperate with you at all times.

SEND FOR OUR CATALOG No. 11

THE BALL & ROLLER BEARING CO.

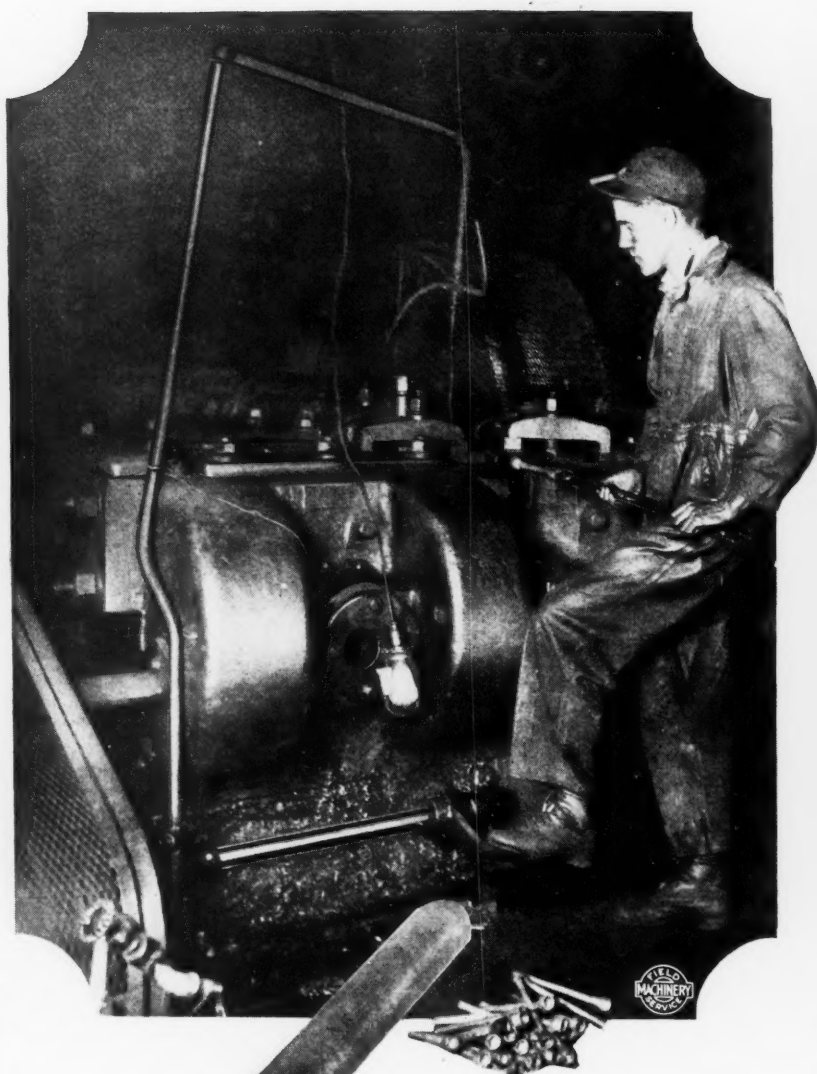
DANBURY, CONN., U. S. A.

2500 Wrenches a Day

Production which reduces cost-to-make to a very favorable figure, and accuracy which leaves little finishing to be done have established this Acme Forging Machine as a decidedly profitable piece of equipment.

It is being used to make socket wrenches. A piece of 9/16" steel rod goes into the machine and emerges as an essentially completed wrench 1 1/8" diameter—the socket 13/16" by 5/8". A three operation die completes the job in one heat—2500 pieces per nine hour day.

Acme Forgings are dependable machines, adapted to all the needs of the average forging shop. Their multi-operation dies, high capacity per heat and speedy change-over to new work make them consistent money makers.

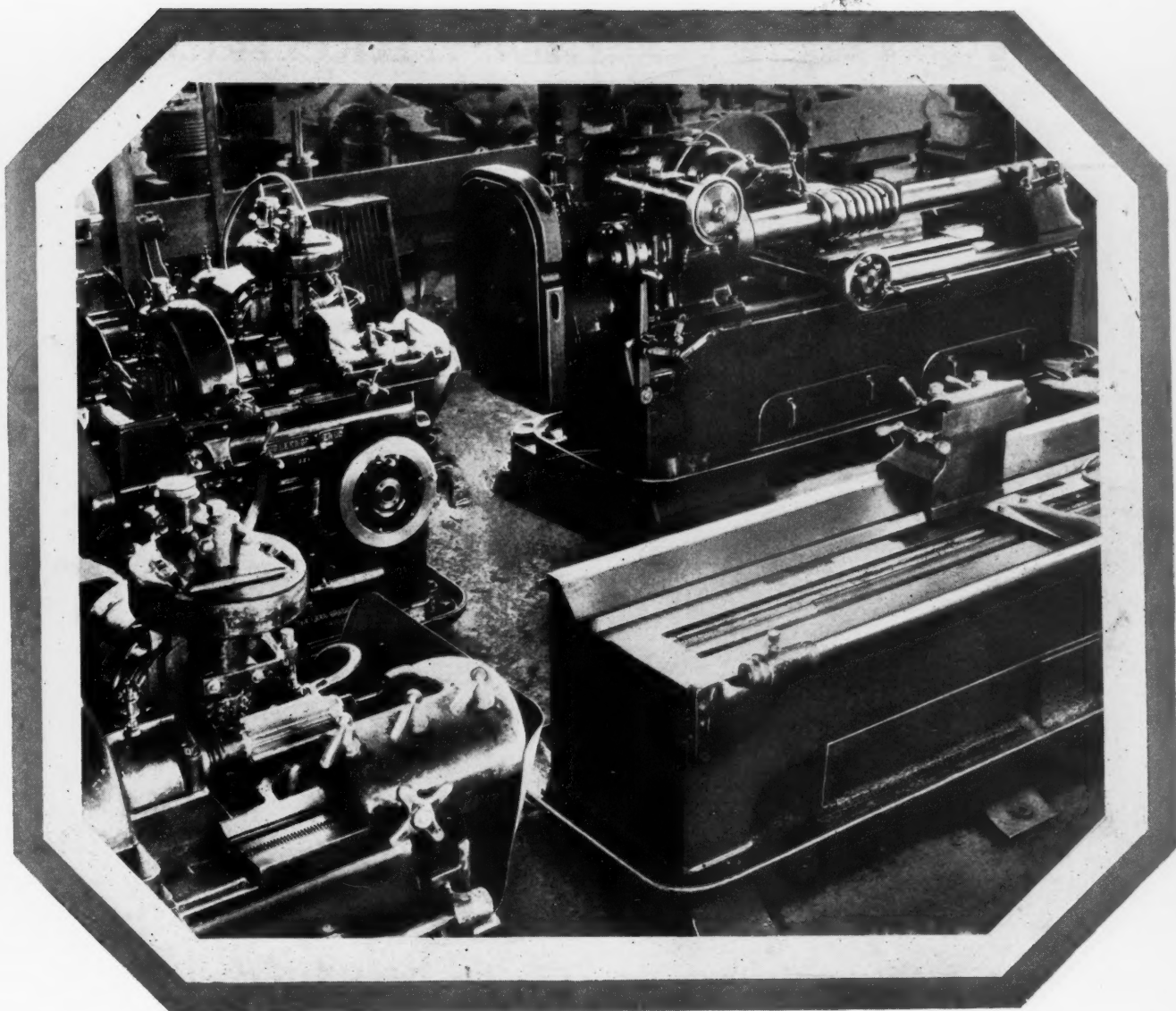


We shall be glad to send you Acme production figures on your work, or data on standard operations.

THE ACME MACHINERY COMPANY
CLEVELAND, OHIO, U. S. A.

FOREIGN AGENTS: Burton, Griffiths & Co., Ltd., London; Glaenzer & Perreaud, Paris, France.

Acme Forging Machines



A Battery of Lees-Bradner Machines in the R. D. Nuttall Plant

This nationally known manufacturer of general industrial gearing considers that Lees-Bradner Gear Hobbers and Thread Millers are of great value to them on account of the high quality of the product and the speed with which the work is turned out.

This means quality at low cost, and is due to the sound engineering principles of the design. The two machines at the top of the illustration are the latest Lees-Bradner models of the Gear Generator or Hobber, and the Thread Miller. The Universal Lees-Bradner Hobber handles Spur and Helical Gears, Worms and Worm Wheels, Spline Shafts, Sprockets and Ratchets.

The line of Thread Millers covers an unlimited variety of work with threads from the finest pitches up to $2\frac{1}{2}$ inches circular pitch, and any lead up to 100 inches.



*Gear Grinders
Gear Testers
Gear Hobbers
Thread Millers*

THE LEES-BRADNER COMPANY, Cleveland, Ohio

“Libby-International”
Turret Lathes

*Reducing Costs and
Increasing Production*



Plan to Go

**NATIONAL MACHINE
TOOL BUILDERS' EXPOSITION**
CLEVELAND OHIO
SEPT 19-23-1927
*The Master Tools
of Industry*

This lathe is shown taking a $\frac{3}{4}$ " cut on the diameter of a rough forging at $\frac{1}{16}$ " feed, raising a cloud of smoke as the lubricant hits the red-hot chips. The forgings are turned down to the dimensions shown in the sketch and then finish turned and threaded—thread measuring 7" diameter by $\frac{1}{2}$ " lead for a distance of 38". This second operation is also performed by the "Libby-International."

INTERNATIONAL MACHINE TOOL COMPANY
Indianapolis Indiana, U. S. A.

DOMESTIC AGENTS: Aumen Machinery Co., Baltimore, Md.; Blackman-Hill & Co., St. Louis, Mo.; Brown & Zortman Machinery Co., Pittsburgh, Pa.; E. L. Essley Machinery Co., Chicago, Ill.; Milwaukee, Wis.; Hill, Clarke & Co., Boston, Mass.; Seifert-Eldst Co., Cincinnati, Ohio; Dayton, Ohio; Cadillac Machinery Co., Detroit, Mich.; Strong, Carlisle & Hammond Co., Cleveland, Ohio; Syracuse Supply Co., Syracuse, N. Y.; Buffalo, N. Y.; Rochester, N. Y.; Vandyk Churchill Co., New York City, N. Y.; New Haven, Conn.; Philadelphia, Pa.; Peden Iron & Steel Co., Houston, Texas; Vonnegut Machinery Co., Indianapolis.

FOREIGN AGENTS: Coats Machine Tool Co., London, England; Ing. Ercole, Vaghi, Milan, Italy; Isbecque Todd & Co., Belgium; V. Lowener, Copenhagen, Denmark; Oslo, Norway; Stockholm, Sweden; Victor B. Mendoza Co., Havana, Cuba; Aux Forges de Vulcaïn, Paris, France; Mitsui & Co., Japan.

A new kind of "confidence game"

THE NEW KIND of confidence game is played by American industry. The rules are simple. You select those companies in whom you have complete confidence and you buy their products.

That's why Haynes Stellite is proud of 1926.

It was a year of progress and of achievement. Stellited bits drilled oil wells, with enviable records of economy and speed. Stellited parts cut down maintenance costs in cement mills. Stellited tools extended the usefulness of Haynes Stellite in machine shops and automotive factories.

Booklets describing the use of Haynes Stellite and the Stelliting process will show you where you can use them in your business. They will gladly be sent on request.

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

KOKOMO, INDIANA

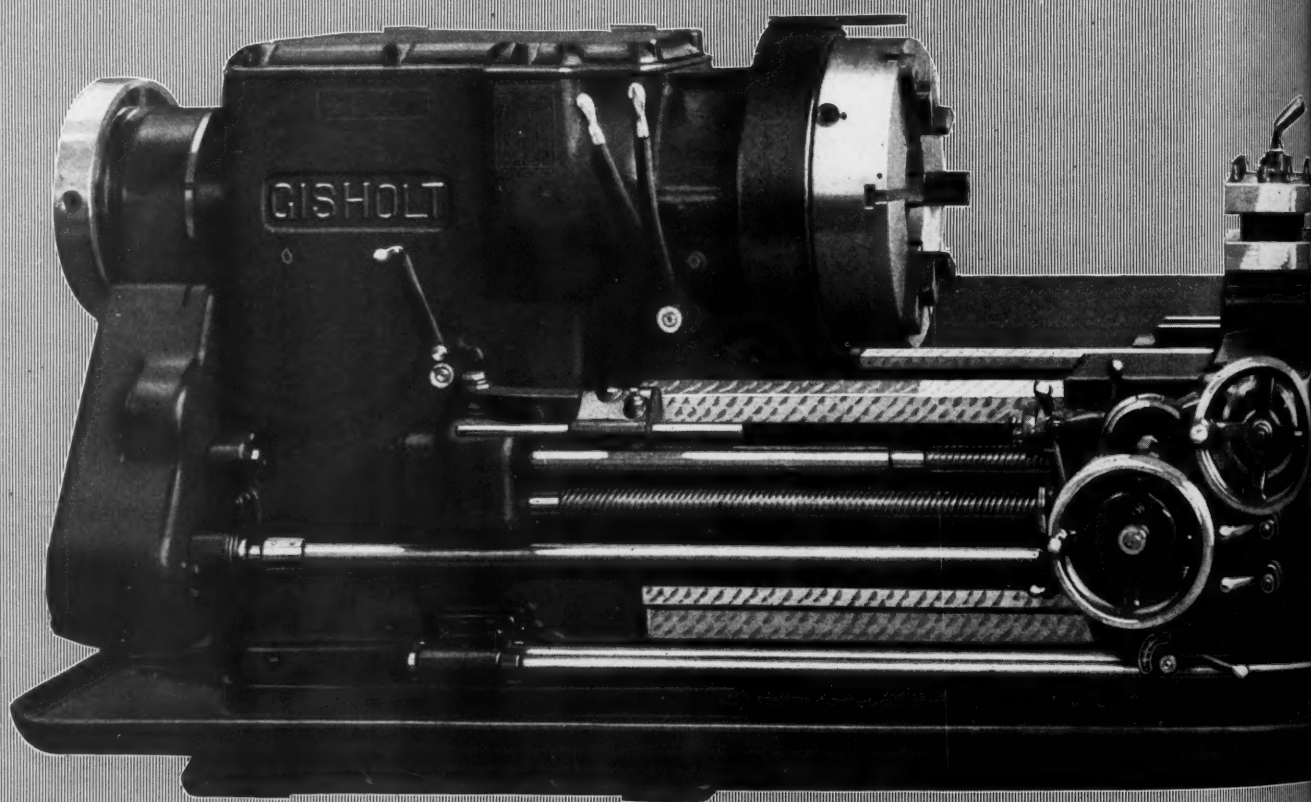
District Sales Offices: Carbide and Carbon Building, 30 East 42d Street, New York; Peoples Gas Building, Chicago; Keith Building, Cleveland; General Motors Building, Detroit; 114 Sansome Street, San Francisco; 1310 Santee Street, Los Angeles.

*Stelliting
with*

HAYNES STELLITE



GISHOLT "L" Type



TO INCREASE

**Machine
Design
Service**

**Tool
Design
Service**

**Field
Production
Service**

Turret Lathes



Powerful enough to handle the heaviest work.

Adaptable enough for a wide variety of pieces.

Simple in tooling and operation.

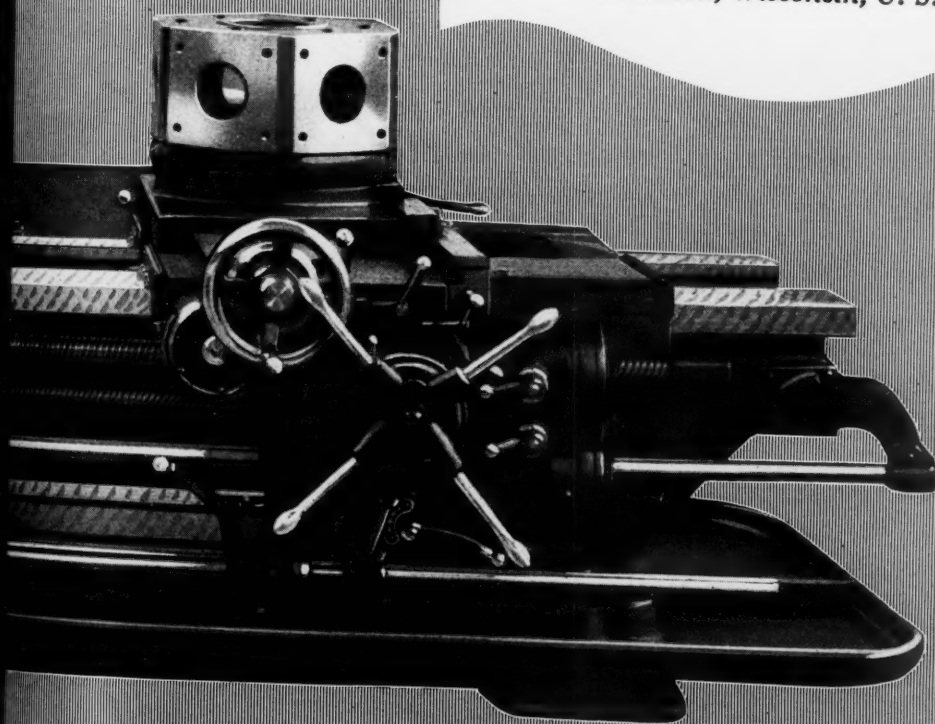
Accurate enough to satisfy the most critical.

Reliable because of the name it bears.

These qualities are outstanding in the Gisholt "L" Type Turret Lathes with Cross Feeding Turret.

GISHOLT MACHINE COMPANY

Madison, Wisconsin, U. S. A.



YOUR CHUCKING PROFITS

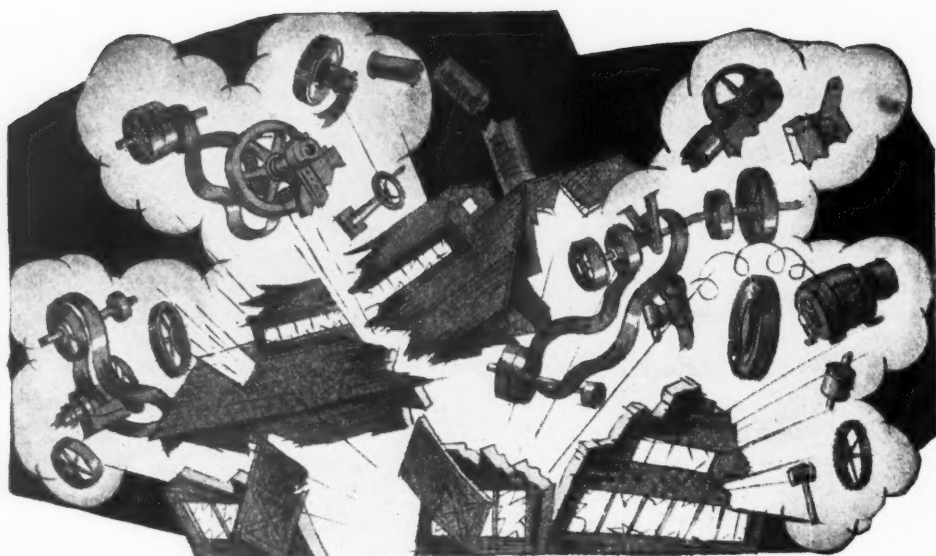
**Heavy
Turret
Lathes**

**Small
Turret
Lathes**

**Automatic
Chucking
Machines**

**Balancing
Machines**

**Tool
Grinders**



Blast the machine shop mentally

PICTURE some lunatic mining underneath your machine shop, planting some dynamite and touching it off some Sunday night when no one was in it. Every old tool is blown to smithereens (wherever that is). You are compelled to put in entirely new equipment.

Your engineers figure on new tools and when they are finished you realize that the difference in production between modern tools and your old ones *will buy you an entirely new machine shop in from two to ten years and keep on earning at the same rate after that.*

Think of it in units

It is even more profitable to think of modernizing your equipment by units. Take the oldest major machine tool you have—a borer, lathe or planer. Let us help you to determine the sav-

ing you could make by changing this to the latest type suitable for your work.

If we do not make the machine tool you should have we will tell you who does.

Stop the eternal drain now

There never was a better day than this to stop the waste of profits that obsolete machines cause.

Let your own engineering department—or ours—prove that you can make big savings or not. Knowledge never hurts a man who can use it. Every penny you save in the shop is *net profit* with no selling or overhead expense snipping it away.

Inventory your old tools. Give us a list showing what you have and how old it is. Or let us send an engineer from one of our plants to talk to you about your equipment.

Niles-Bement-Pond Company, 111 Broadway, New York

Divisions of NILES-BEMENT-POND COMPANY

THE NILES TOOL WORKS COMPANY, Hamilton, Ohio

NILES GEAR COMPANY, New York

PRATT AND WHITNEY COMPANY, Hartford, Conn.

NILES CRANE CORPORATION, Philadelphia, Pa.

THE PRATT & WHITNEY AIRCRAFT CO., Hartford, Conn.

SPRINGFIELD

Ball Bearing Geared Head

ENGINE LATHES

Produce More—Earn More

The unequalled producing powers of Springfield Lathes is a big reason for their great earning powers, for profit follows production and production, to a large extent, depends upon the lathe.

There are, however, other qualities in Springfields that take them far out of the "just another production lathe" class. They are tried and true in the toolroom, and keep turning costs at a rock-bottom "low" wherever applied.

Vibrationless at all twelve speeds, their designers have reduced friction by locating ball bearings at all journals, main spindle excepted. Friction clutch and brake.

Concentrated control. Earn more with Springfields!

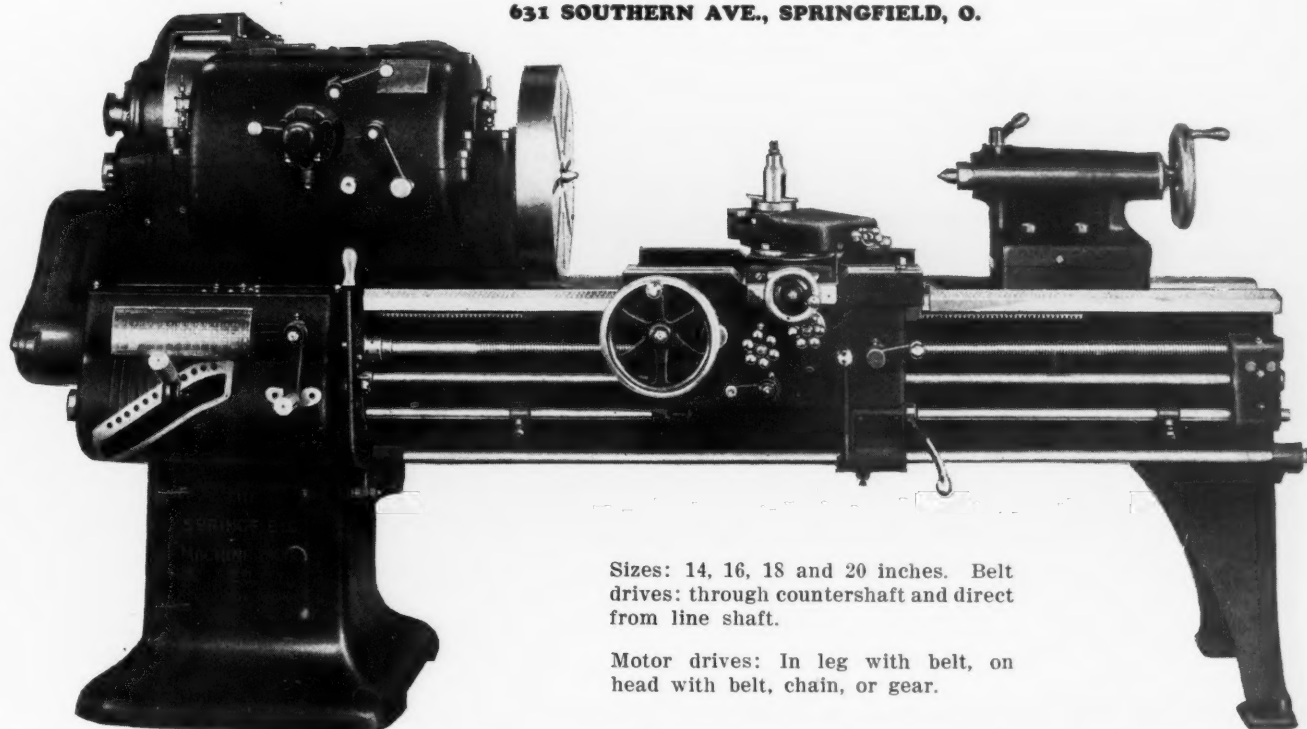


Send for informing circulars

THE SPRINGFIELD MACHINE TOOL CO.

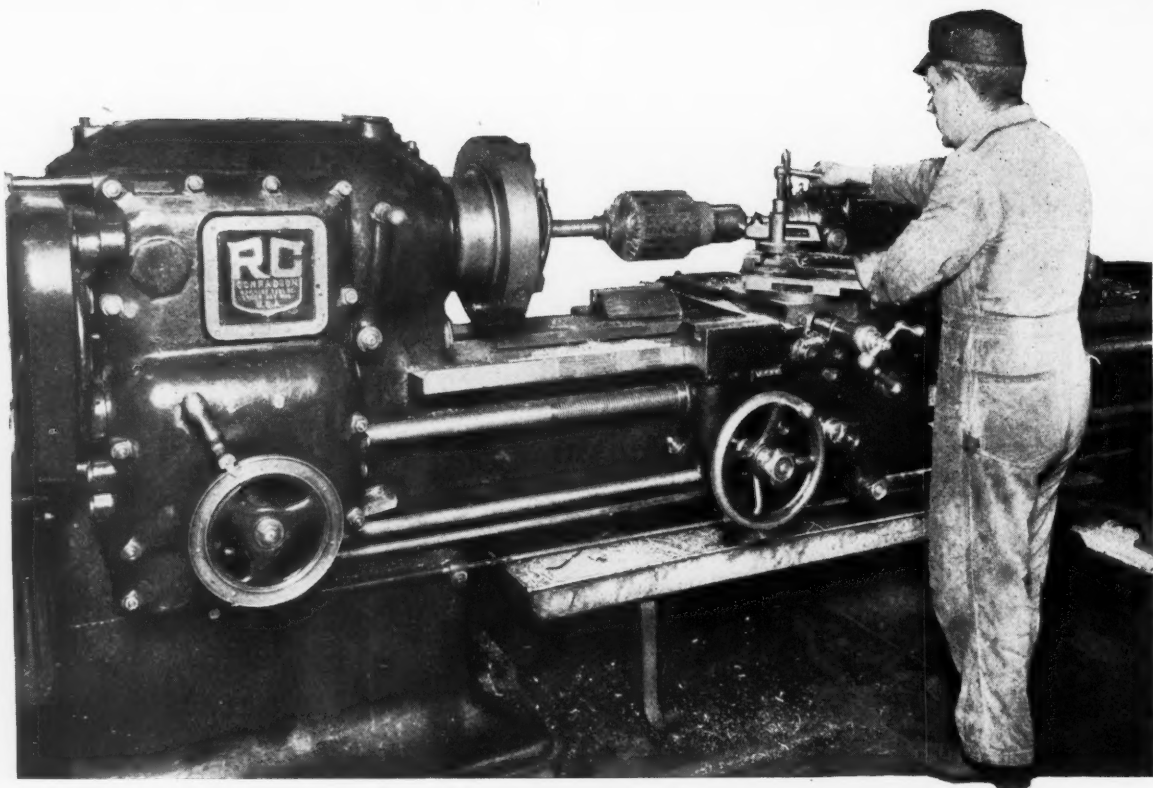
Manufacturers of Springfield Lathes and Shapers

631 SOUTHERN AVE., SPRINGFIELD, O.



Sizes: 14, 16, 18 and 20 inches. Belt drives: through countershaft and direct from line shaft.

Motor drives: In leg with belt, on head with belt, chain, or gear.



Tools for Production, Maintenance, Repair Shops

All round service is another advantage in an Armstrong Tool Holder. One Armstrong Tool Holder and a few tool bits—Armstrong bits preferably—is all the equipment needed for a wide variety of work.

In this railroad shop they are used for production, maintenance and repairs; they are used on work that tests the capacity of big machines, on precision operations, and on ordinary jobs like the one shown in this photograph—cleaning up a commutator.

Armstrong Tool Holders are strong and rigid, correctly designed and well made. Projecting support under the cutter; maximum clearance; oversize cutter and head; patent stop for cutter; extra large screw;—study an Armstrong Tool Holder and you'll see why it gets uniformly profitable results.

Send for catalog B-27 of Armstrong Turning, Boring, Threading, Knurling, Cutting-Off Tools

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

313 N. Francisco Ave. Chicago, Ill., U. S. A.



For Best Results
Use Armstrong
High Speed
Cutter Bits

ARMSTRONG

TRADE MARK REG. IN U.S. PAT. OFFICE

National Machine Tool Builders' Exposition News**

PUBLISHED BY NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION
MAKERS OF THE MASTER TOOLS OF INDUSTRY

Plan to Go! - - to CLEVELAND - - September 19th-23rd inclusive

\$40,000 For Power Needed To Prepare Big Show Building

Forty Thousand Dollars in new electrical equipment and in providing other necessary accessory services is being spent to condition the new West Annex of Cleveland's famous \$5,500,000 Public Auditorium for the great Exposition, September 19th-23rd inclusive.

So much op-

Three Miles Of Freight To Transport Greatest Of Shows To Cleveland

A freight train nearly three miles long!

With not an "empty" among all its couplings, but filled with American machine tools and machine accessories!

Its destination, Cleveland, and the "Greatest Machine Shop in the World"!

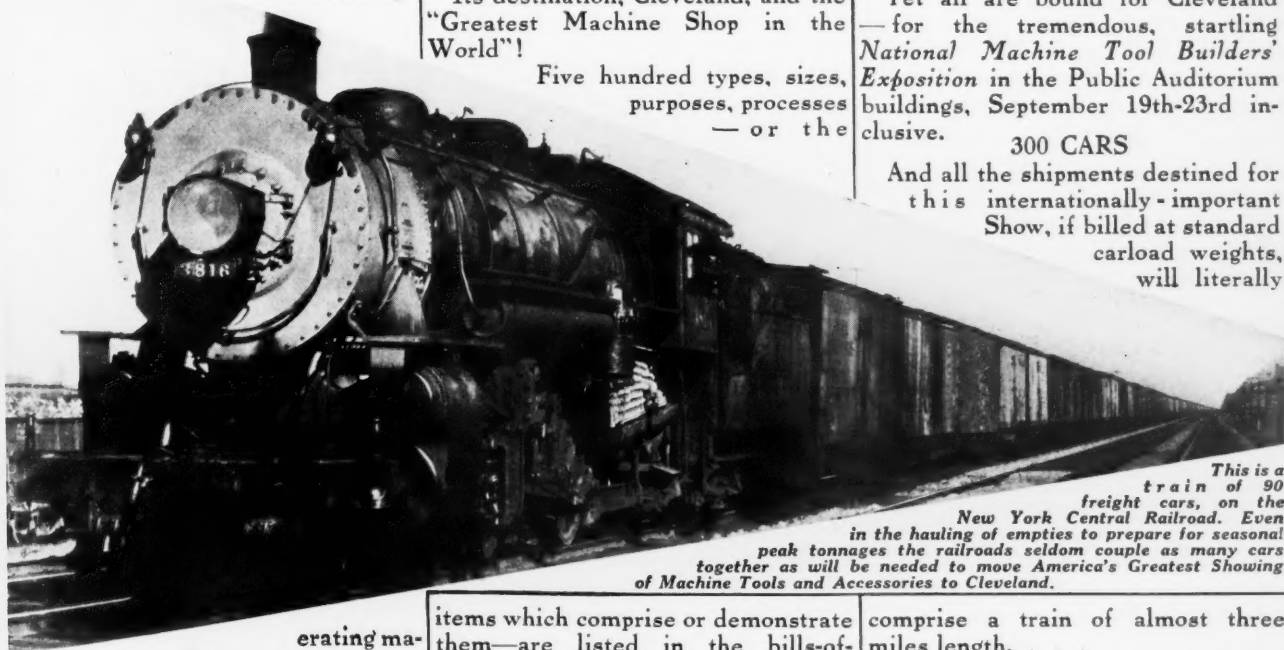
Five hundred types, sizes, purposes, processes — or the

These cars will leave St. Louis, Boston, Brooklyn, Detroit, towns and cities in Illinois—Ohio—Pennsylvania—sidings in twenty different states—on different dates—via different routes.

Yet all are bound for Cleveland — for the tremendous, startling National Machine Tool Builders' Exposition in the Public Auditorium buildings, September 19th-23rd inclusive.

300 CARS

And all the shipments destined for this internationally-important Show, if billed at standard carload weights, will literally



This is a train of 90 freight cars, on the New York Central Railroad. Even in the hauling of empties to prepare for seasonal peak tonnages the railroads seldom couple as many cars together as will be needed to move America's Greatest Showing of Machine Tools and Accessories to Cleveland.

erating machinery and equipment will be installed in this single, concentrated review of America's mechanical production progress, that more power is called for than probably has ever before been needed for an industrial exposition.

IN CITY'S CENTER

The Exposition Buildings are at E. Third St., Lakeside and St. Clair Aves., only five minutes' walk from the center of the business section, and from several hotels, including the Cleveland, the Hollenden, the Olmsted and the new Auditorium Hotel.

items which comprise or demonstrate them—are listed in the bills-of-lading of this colossal shipment.

No such assembling of machine tools and related products—and of nothing else—has ever been known in the continent's history. They make up the displays for America's greatest mechanical production Show.

180 STARTING POINTS

No one will ever see this giant train against the skyline as a transportation unit. Its single cars cannot be linked behind one set of locomotives, because their points of origin are 180 different plants in eighty different cities.

comprise a train of almost three miles length. . . .

300 cars—their contents for examination by you—by interested visitors to the Show!

TOOLS—TOOLS—TOOLS

What is this Show? Machine tools—their accessories and related products! Machine tools revealed truly, in tremendous scope, as the Master Tools of Industry! The greatest range of mechanical tools ever beneath one American roof! Tools of amazing new design and efficiency! Literally an epoch-making, an almost indescribable Exposition! Not for the general public!

Our Men There Says Chrysler— Others Concur

From New York, Walter P. Chrysler, Chairman of the Board of the Chrysler Corporation, makes this comment: "—This is a most excellent plan of the machine tool industry having such a complete exposition, particularly as they are going to keep it exclusively for experts who are directly interested in machine tools. I think great benefit and good will be done for the industry and that it will be successful. Arrangements are being made for our men to attend."

J. A. Smith, General Superintendent of the General Electric Company, writes from Schenectady: "—I expect to attend personally and will certainly send a considerable number of our leading men, as it has been our experience that we get more information on the latest developments in machine tools and accessories—than can be obtained by any number of visits to plants."

The Frigidaire Corporation will send a delegation to the show from Dayton, Ohio. E. G. Biechler, President and General Manager, says: "—We will have ample representation . . ."

J. A. Droegge, General Manager of the New York, New Haven and Hartford Railroad Company observes: "—Unquestionably this will be a worth while exhibit, particularly as it will be confined to those directly interested—if it is possible (and I think it will be), we will have representatives present."

F. H. Greenwood, Superintendent of Shops of the Norfolk and Western Railway Company, writes from Norfolk: "—it will enable the railroad people as well as others to get first hand information in regard to improved machinery.—I hope to be able to visit Cleveland during the exhibit and probably some of our others will attend."

W. F. Hosford, Engineer of Manufacture of the Western Electric Company, says: "—You may be sure that this exposition will be attended by our engineers who are responsible for keeping our machine tool practice up to date."

: Friendly :

Daily and more various reports now reach a score of interested observation centers, and the offices of nearly 200 exhibiting companies, of the unusual attendance that will characterize the Cleveland Show.

* * *

The great Cleveland Show is sponsored by the *Makers of the Master Tools of Industry*, the National Machine Tool Builders' Association, solely for the education and commercial advantage of the machine-using industries. . . . It is for machine operators, men from great key industrial plants and, no less, from relatively small and isolated machine and fabricating shops, who are responsible for mechanical performance and maintenance. . . . It is for foremen. . . . It is for the technical staffs of manufacturing companies everywhere and of every type, whose daily duties breed a practical or theoretical interest in mechanical tools. It is, equally, for the consulting technician, for the engineer or specialist who must keep abreast of mechanical developments. . . . It is for the specifying and purchasing executives, and the general executives and important stockholders of industrial companies the products of which require mechanical production tools and technique. . . .

* * *

It is for the man who works across mahogany—the man who works in overalls. It is for *everyone* who has an actual job, professional or business interest in machine tools and their accessories, and in mechanical production economics.

* * *

So, it's a *friendly* Show—a Show where community of interest and contact begins at the registration desk and carries through to the corner-most booth. It's a Show to which a visitor may bring his family if he wishes.

* * *

No one needs an invitation ticket—nor is there an admission fee. A prompt registration corps at the entrance provides week's admission badges and a detailed directory of the Show's multitudinous products.

Tools At Show Of All Kinds— For All Uses

"Everything pertaining to machine tool utilization"—that is the great Cleveland Show!

It will require 200 pages to catalogue in detail the machines, processes, materials, accessories, to be displayed and demonstrated there, many of them in operation, all of them directly relating to machine production efficiencies.

At random, these are some of the novel, or standard—the striking, or proven—items, features, sidelights of the Exposition:

A gear tooth comparator for gauging the correct thickness of gear teeth and for comparing the thickness of gears to master blocks, working on the master rack principle.

An internal grinder taking work up to 48" in diameter which will grind a hole 15" deep and 32½" in diameter, the machine being sufficiently massive to handle pieces up to a weight of 2,000 pounds.

* * *

New tool applications of diamonds for boring, particularly in multiple cutting operations, such as crankcase boring and reaming.

* * *

An automatic forming and threading machine which automatically forms the points on bolts and threads them.

* * *

An automatic screw machine with chip conveyor built into pan of machine.

* * *

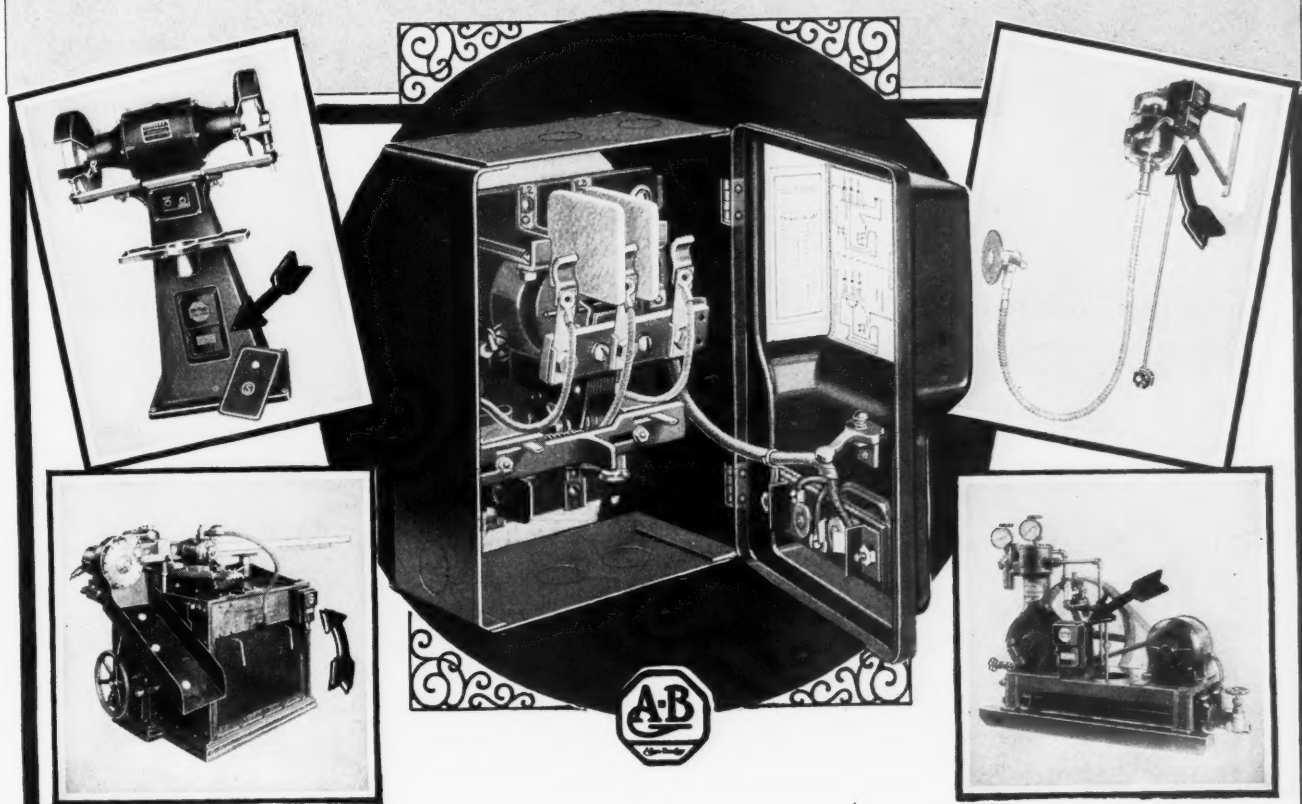
A planer-shaper of unique design, embodying many earlier notable features.

* * *

Broaching machines, hydraulically operated—newest methods of machine tool construction showing self-contained power plants—recent developments in power transmission using herringbone gears, silent chains, etc.—the new movement for simplification and compactness demonstrated by new designs—the thousand and one indices of constant basic design progress—**AT CLEVELAND!**

The EXPOSITION NEWS is the news-feature-photo publication for every one whose interest in machine tools and their utilization, and in related materials, equipment, methods and processes, makes him eligible to attend America's Greatest Showing of Machine Tools and Accessories—the National Machine Tool Builders' Exposition, West Annex and Arcade, Public Auditorium, Cleveland, September 19th-23rd inclusive, 1927. Published, as advertising matter, by the National Machine Tool Builders' Association, 630 Vine Street, Cincinnati, Ohio.

Complete Protection for Small Motors at Lowest Cost



NOW you can provide every machine driven by motors up to 2 horsepower with push button control, overload relay protection and no-voltage release at lowest cost.

The Form B Switch provides all these up-to-date safety and control features. The cost is low. The push buttons in the cover reduce wiring and installation costs very materially. The sturdy little switch can be mounted near the operator. It is the last word in safety, efficiency and convenience.

Investigate the low cost of safety and convenience provided by this remarkable switch.

Relays are reset without opening cover

A lever in the front cover of the Form B Switch resets relays without opening cover. Any workman can safely and quickly reset relays without delay. Eliminates calling electrician.

Allen-Bradley
Type J-1552 Form B
ACROSS-THE-LINE STARTING SWITCH

Allen-Bradley Starters

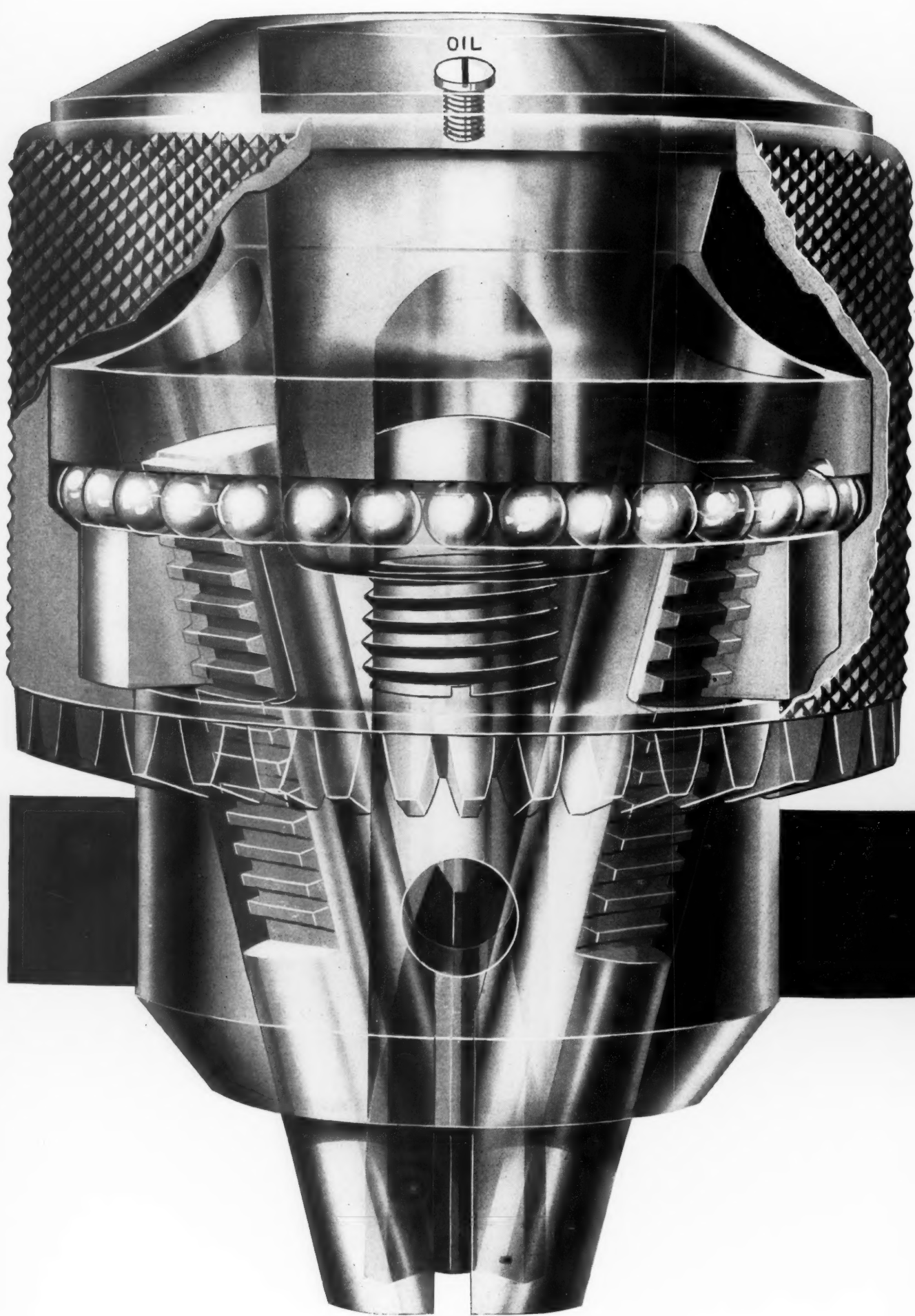
MAIL THIS COUPON

For bulletin No. 709 describing the Type J-1552 Form B Push Button Switch.

Address: ALLEN-BRADLEY CO.
499 Clinton Street
Milwaukee, Wis.

Name.....

Address.....



A Vital Factor in Modern Production

A quick twist of the wrist grips the drill for average drilling, while the slightest pressure of key suffices for the heaviest work—this is the action of The New Jacobs Super Chuck, the chuck that has set new standards of accuracy—that is a vital factor in remarkable production increases and cost reductions.

The Super Chuck grips with tremendous power, yet is a marvel of perfect mechanical balance.

Your machines—your product will soon show, in records and quality, the use of this marvelous tool.

The Jacobs Manufacturing Co.,

Hartford, Conn.

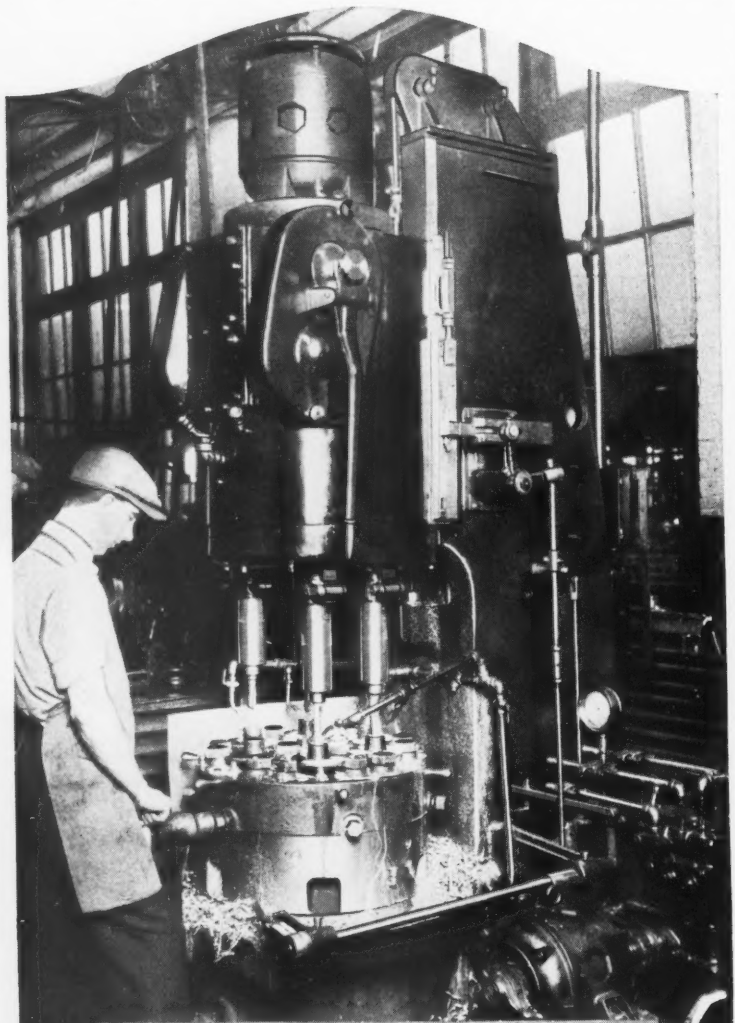
*The World's Largest
Producers of
Drill Chucks*

ROCKFORD

OILGEAR FEED TYPE

Drilling and Boring Machines

Kelsey Wheel Replaces Four Machines with One Rockford



This Rockford Oilgear Feed Type Drilling and Boring Machine—recently installed by the Kelsey Wheel Company, Detroit, Mich.,—is being used to drill and taper ream automobile rear wheel hubs. The close-up shows the pieces before and after—tough steel forgings. The hole goes through 3-5/64" of metal and is 1-5/16" at the large end with a 1" per foot taper.

A six-station indexing fixture carries the work. Loading and unloading take place in one while the following operations occur in the other five. The first three spindles successively drill the hole. The next spindle—rough reams, the last finish reams. Production is 62 pieces per hour. The former method employed four single spindle machines run by one man—two for drilling and two for reaming.

The Spindle Units on Rockford Oilgear-Feed Machines are interchangeable. Heads can be placed vertical as shown, horizontal or at an angle singly or in multiple. Tables can be arranged to suit any job.

We shall be glad to answer all the many questions sure to suggest themselves—and to tell you in detail how Rockford Oilgear Feed Machines can be applied with profit to your work.

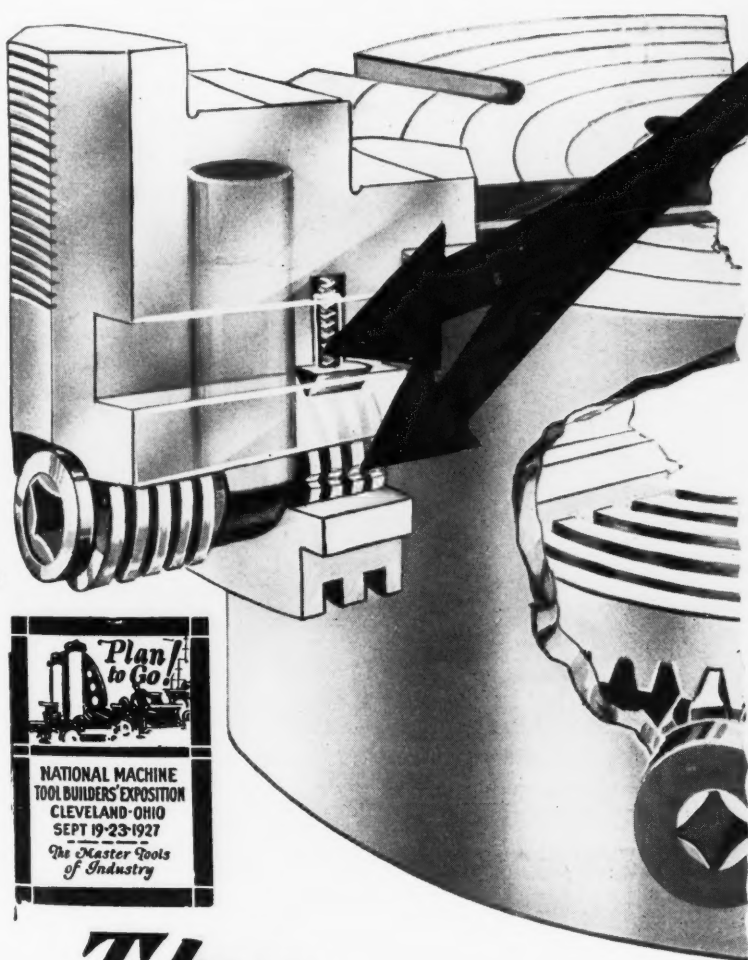
Rockford Drilling Machine Co.

Rockford, Ill.



Click

and you have it!



**"CUSHMAN"
CHUCKS
1862**

Exact positioning of chuck jaws, eccentric or concentric—no fussing, measuring, coaxing the jaws to the mark—and true to 0.005"!

No other chuck has this patented self indexing feature which assures perfect concentricity. The Cushman Tri-plex Chuck is self-centering, independent — can be changed from eccentric to concentric in a jiffy. Geared scroll type, jaws hardened at every point, all parts interchangeable. Hardened self-cleaning screws have patented self-aligning thrust bearing with extra large bearing surface.

Let us send you complete details of this and other Cushman Chucks.

THE CUSHMAN CHUCK CO.
Hartford, Conn.



THE NEW TRI-PLEX CHUCK



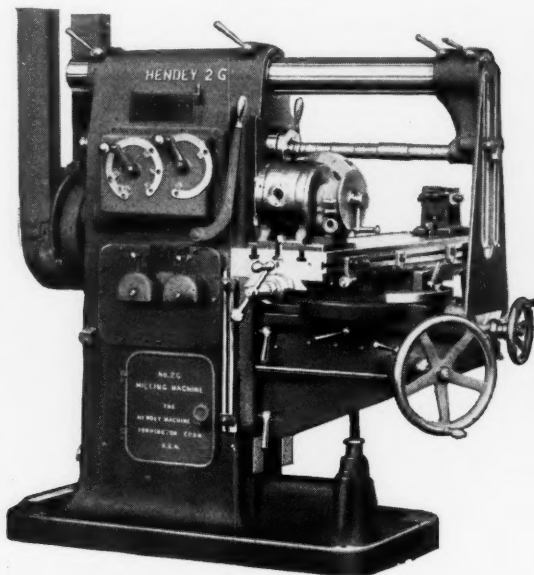
Builders of the world-famous Hendey Lathe and Hendey Shaper.



THE HENDEY No. 2-G Universal Milling Machine

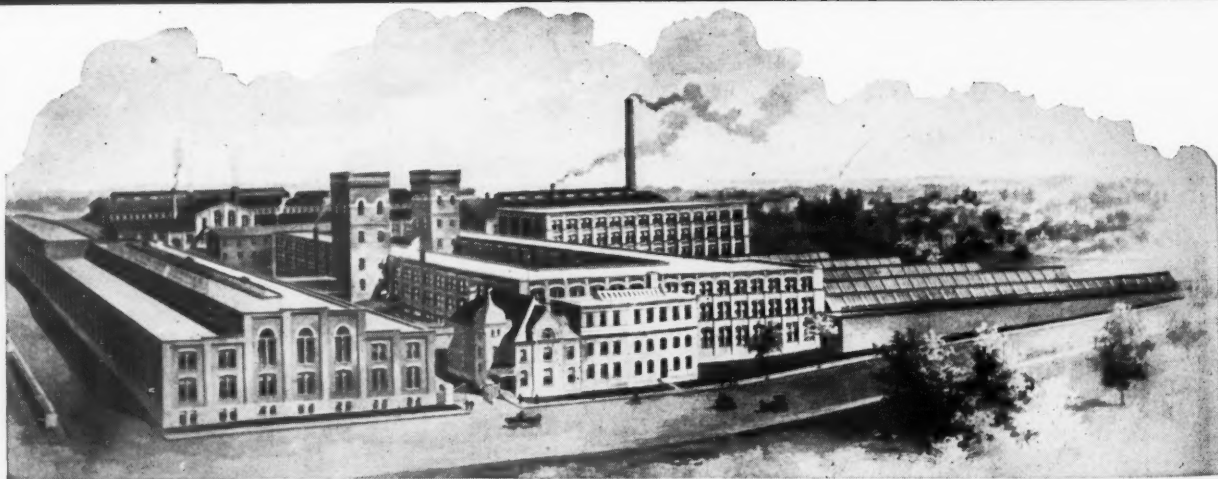
combines every improvement that facilitates operation and adds to the convenience of the modern manufacturing plant.

It has 18 progressive spindle speeds. All driving gears of alloy steel, hardened and heat treated scientifically. Driving shafts and pulley mounted on ball bearings. All bearings and speed gearing under continuous automatic lubrication when machine is in operation. Two central levers for friction start and stop clutch.



THE HENDEY MACHINE CO.
TORRINGTON, CONN., U. S. A.

Singer Bldg., New York City 525 Washington Blvd., Chicago, Ill.
Commerce Bldg., Rochester, N. Y. 1534 Dime Bank Bldg., Detroit, Mich.



A New Size Tapper

No. 2—Capacity 0 to $\frac{3}{8}$ "



Anything that can be tapped by hand can be tapped with an Ettco tapper. The Ettco taps blind holes as easily as those which go through—and it eliminates broken taps.

There is no friction to adjust in the Ettco.

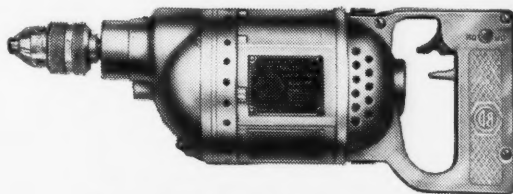
Production increased 100% to 500% on many jobs.

Don't condemn the taps you are using—try an Ettco tapper for ten days without obligation.

Ettco

Ettco **Keyless Ball Bearing Drill Chucks** can be supplied, with proper thread or taper for all makes of portable drills, electric or air.

- No. 1-A Ettco—0 to $\frac{1}{4}$ in. \$5.50
- No. 1½-A Ettco—0 to $\frac{5}{16}$ in. 6.00
- No. 2-A Ettco—0 to $\frac{3}{8}$ in. 6.50
- No. 3-A Ettco—0 to $\frac{1}{2}$ in. 9.00
- No. 3½-A Ettco— $\frac{1}{8}$ to $\frac{5}{8}$ in. 11.00



*The Best Chuck ever made
for Electric Drills.*



EASTERN TUBE & TOOL CO., Inc., 590 Johnson Ave., Brooklyn, N. Y.

Trade Mark



Reg. U. S. Pat. Off.

SKINNER CHUCKS FOR MODERN MACHINE TOOLS



The Skinner Chuck as supplied for use on the Norton Grinder.

Norton 12" x 36" Type L Multipurpose Grinding Machine regularly equipped with a Skinner Chuck

Skinner Chucks Are Standard Equipment on Norton Grinders

NO matter how fine a machine tool may be, the quality of work it turns out is strictly limited to the capabilities of the chuck with which it is equipped.

The Norton Company, internationally famous manufacturers of grinders, equip all machines with Skinner Chucks, because these chucks possess the accu-

racy and dependability that enable Norton Grinders to turn out their best work.

The number of leading machine tools with which Skinner Chucks are furnished as standard equipment is constantly increasing.

There can be only one reason—Skinner Chucks give service that cannot be equalled.

Use Skinner Chucks and Get Better Work

THE SKINNER CHUCK COMPANY

NEW BRITAIN, CONN. U. S. A.

LATHE-DRILL-PLANER-CHUCKS

MANUFACTURERS OF WRENCHLESS "AIR OPERATED" CHUCKS

Announcing

No. 242

Self-Oiling All Geared Drill and Tapper

Capacity: 1½" in steel

Distinctive Qualities

Transmission has 10 Timken Taper Roller Bearings.

Drive Shaft and Cross Spindle have Fafnir Radial Ball Bearings.

Alloy steel gears—heat treated.

Six splined spindle and sliding gear shaft.

Star Wheel Handle. Leverage ratio 35 to 1.

Steel sleeve has rack teeth cut integral and torque taken by hardened rollers free on cross spindle.

Spindle sleeve is bronze bushed and sleeve housing is bronze bushed.

Eight Quick Change *Spur* Geared Feeds.

Quick Change Speeds—eight, four or one.

All control levers brought to front of machine.

Gears fully enclosed, meeting safety laws.

Our efficient Multiple Disc Clutch is used for driving and for reversing.

Sturdy construction.

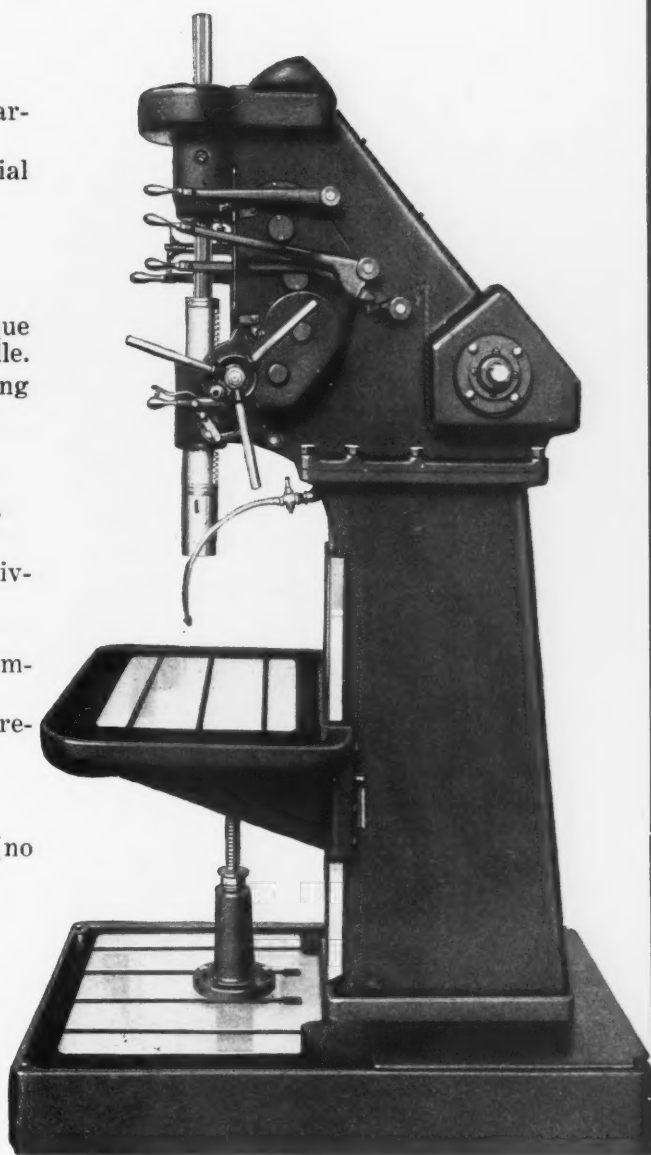
Rigid spacious table—deflection practically eliminated.

Table has spacing blocks or raising screw as preferred.

Self-Oiling bearings throughout.

Maximum productive capacity.

Minimum installation and maintenance costs (no inherent belts to buy or to maintain).



**Built for Quantity and Quality
Production Work**



Ask for Catalog "M".

On Display at Cleveland Show, Sept. 19th to 23rd.
Our Booth No. 221

BARNES DRILL CO.

814 Chestnut St., ROCKFORD, ILL.

Production Tool!

It has all the qualities needed for every
production tool. It is the Thompson Flexible
Back Band Saw with teeth hardened only to the
point of the tooth, the remainder of the blade left *flexible*.

For nearly half a century of saw
production, the Thompson unmatched
accuracy of workmanship
and service. Metal cutting, *your*
particular cutting, can be improved
by use of the Thompson Flexible Back Band Saw.

Take for free trial offer and
prove your satisfaction



The Henry G. Thompson & Son Co.

Established 1876

Incorporated

New Haven, Conn., U. S. A.

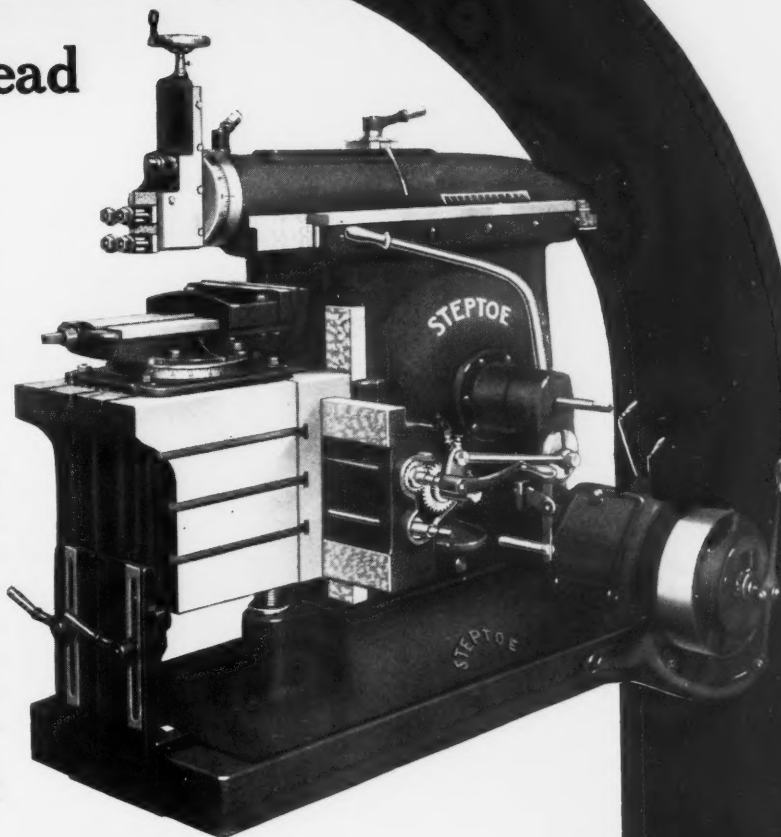


The Latest Development in STEPTOE TAPERED ROLLER BEARERS

Timber Roller Bearing Equipment Throughout

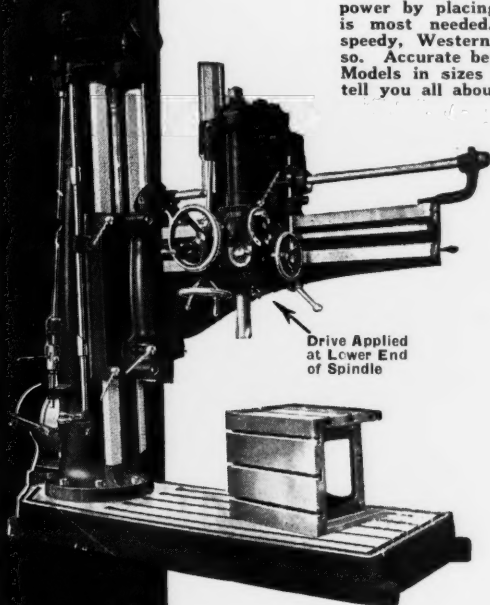
Always Step Ahead
Production

StepToe rollers are built for
—designed to carry
weight in the column,
base so that the heav-
can be taken with high
el. Improvements have
ny since the first Step-
er, introduced in 1845.
st is the adoption of
Tapered Roller Bear-
omoting a new degree
h, vibrationless opera-
permanent accuracy.
nsumption and upkeep
re low — adaptability
will pay you to invest-
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to 24 inches—*plain and*
red models.



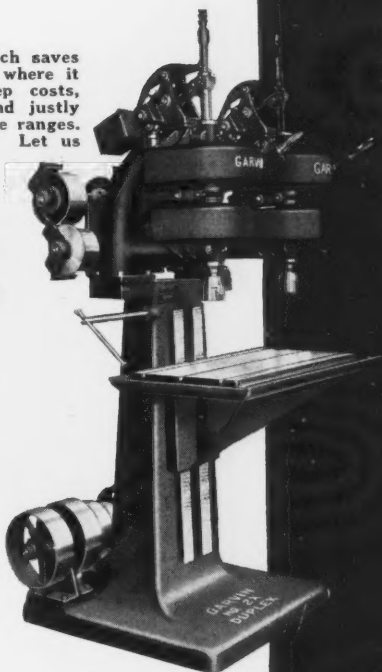
Western Radial Drills

The famous radials with the "Low Hung Drive", which saves power by placing it at the lower end of the spindle, where it is most needed. Vibrationless, economical in upkeep costs, speedy, Western Radials are standard everywhere—and justly so. Accurate beyond belief on all jobs within their wide ranges. Models in sizes ranging from 3 foot to 8 foot arms. Let us tell you all about them.



Garvin 2X Duplex Automatic Tapping Machine

A double edition of the Garvin Single Spindle Tapping Machine. Two heads, tapping holes of different sizes at the same time. Automatic after operator has "Just Pulled the Starting Lever." Automatic tap reversal. An accurate and profitable production unit. Capacity in each head for driving $\frac{1}{4}$ " to $\frac{7}{8}$ " U. S. standard taps in cast-iron or from $\frac{1}{4}$ " to $\frac{3}{4}$ " in steel. Pipe capacity $\frac{1}{2}$ " in cast-iron and $\frac{3}{8}$ " in steel. Catalog upon request.



WESTERN MACHINE TOOL WORKS

Holland, Mich., U. S. A.

CONWAY CLUTCHES

*Are
Dependable
Clutches
Necessary in
Your Machines?*

The Trowbridge Conveyor Company of Passaic, N. J., use Conway Clutches exclusively in the manufacture of their gasoline and electric driven portable and stationary conveyors. Mr. W. H. Trowbridge, President, says: "I have used Conway Clutches for at least ten years and have found them fool-proof, durable, and simple to apply and operate. They are the best clutch adaptable to conveyors and transmission machinery." The close-up shows the No. 4 Conway Clutch assembly used in the Trowbridge Bucket Truck Loader.

No comment of ours need be added to Mr. Trowbridge's statement save to say that these qualities are putting Conway Clutches not only into conveying equipment but every type of machinery where dependable and efficient starting and stopping is important.

*Made in size,
style and type
to satisfy every
clutch require-
ment. Let us
discuss yours
with you.*

THE CONWAY CLUTCH COMPANY

1962 West Sixth Street, CINCINNATI, OHIO

"ADRIANCE"

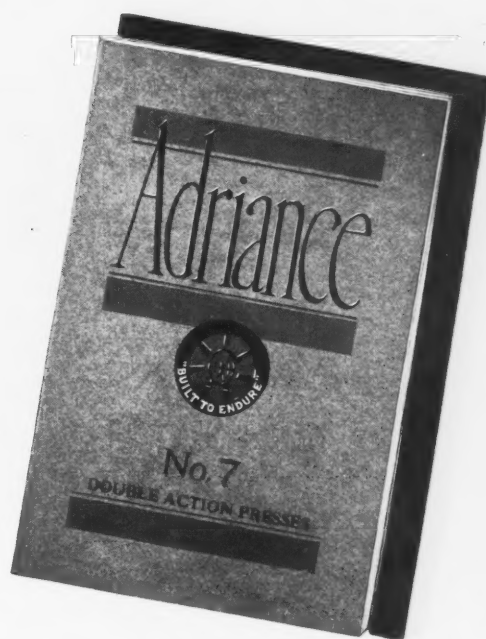


DOUBLE ACTION CAM PRESSES WITH POSITIVE LIFT

A distinctive feature in these presses, which assures mechanical efficiency and long life for the press, is the forging from one piece of steel of the crankshaft and the cams.

This is but one of the many "Adriance" features that make for structural strength, economical production, low cost of maintenance and a lifetime of service.

BUCK & HICKMAN, LTD.
2 Whitechapel Road, London
Sole Agents for Great Britain



ADRIANCE MACHINE WORKS, INCORPORATED

78 RICHARDS STREET, BROOKLYN, N. Y.

Please send copy of "Adriance" Bulletin No. 7.

Name.....

Address

ROCKFORD

Universal Shaper-Planer

Gives Flat, Parallel Surfaces—Turns Work Out Fast!

Because of its adaptability and steady accuracy, the Rockford Universal Shaper-Planer can be put to endless uses.

Here is a Shaper-Planer working on a cast iron disc—part of a die set—in the plant of the E. Baumbach Manufacturing Co., Chicago. This company makes sub-presses and die sets, and they say about their Shaper-Planer, "It produces flat, parallel surfaces and works very rapidly." As can be seen, an auxiliary plate has been bolted to the table and a convenient turret tool post attached.

Rockford Shapers are handy, economical and offer a satisfactory method for doing a great variety of work frequently difficult to handle on a paying basis.



Let us tell you about other interesting Shaper-Planer installations, and send a complete description of the machine.

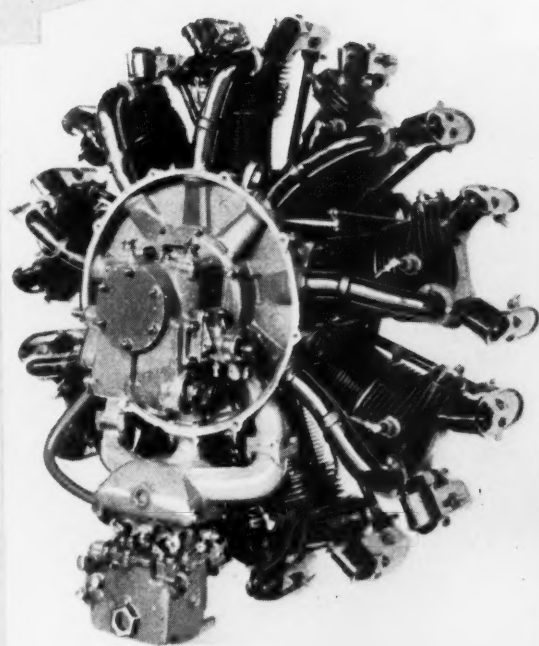
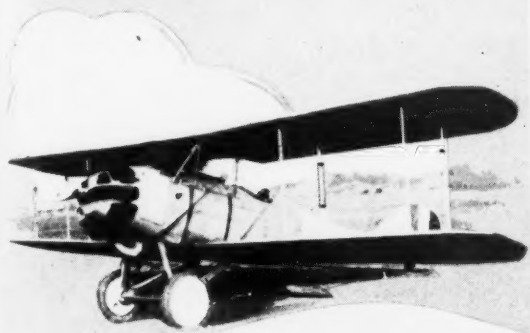
Two sizes—26" and 36" table travel—the larger has a side head.

ROCKFORD TOOL CO.

240

d, Ill.

The Foremost Air
Craft Engine of the Day *and a*
**UNIVERSAL
BORING MACHINE**
Helps Make It.

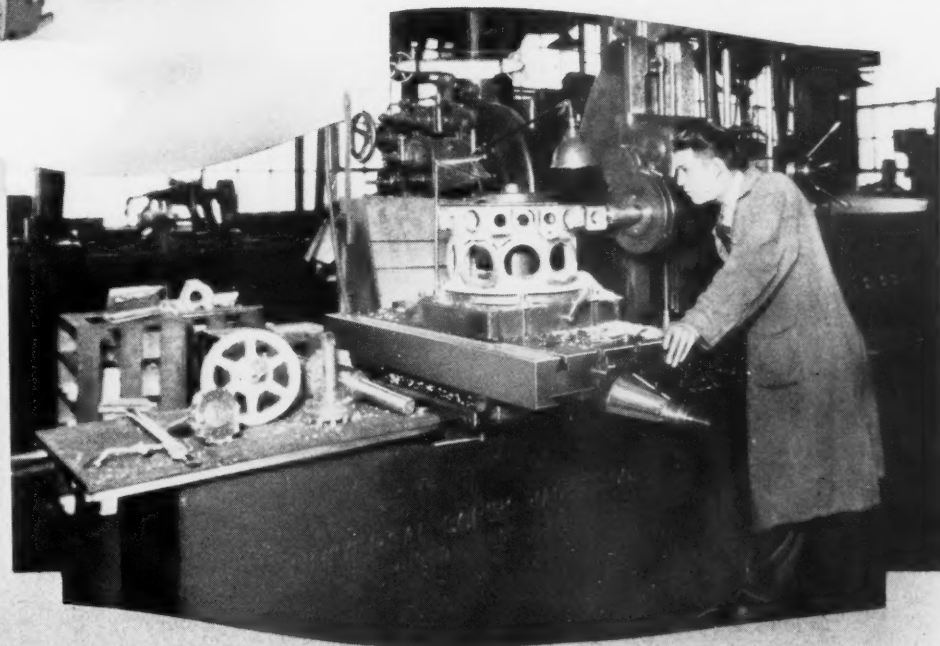


The famous Wright "Whirlwind" aircraft motor reflects no small measure of glory on the array of modern machine tools used in its manufacture. The motor itself is an example of a product turned out by a plant thoroughly efficient and up-to-date in all its appointments.

We count it a tribute to Universal Boring Machines that they are used in the Wright plant for boring the crankcase main sections of the J-5 motor, the same type that carried Lindbergh, Chamberlin and Byrd on their historical flights.

One of the two Universal Machines used in the Wright plant is shown below. It averages 48 hours per week of steady operation.

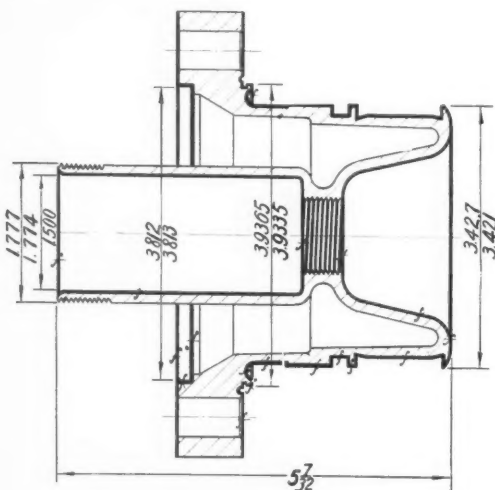
May we give you full details of Universal Boring Machines—how they can be used in your work?



Universal Boring Machine Company, Hudson, Mass., U.S.A.

POTTER & JOHNSTON AUTOMATICS

Manufacturing Knight Engine Cylinder Heads requires adherence to close tolerances. P. & J. AUTOMATICS accomplish this result at a low cost of production.



We will exhibit at the
7th Annual New Haven
Machine Tool Exhibition
Sept. 6-7-8-9

METHOD

1st Holding

Work held in three-jaw chuck with top of flange against face of jaws.

First Turret Face: Rough turn outside diameter, core drill spark plug hole.

Front Cross Slide: Rough face bottom of flange to dowel diameter, rough face bottom of head, rough turn junk ring groove.

Second Turret Face: Rough form combustion chamber.

Rear Cross Slide: Rough face bottom of dowel.

Third Turret Face: Bore Spark Plug hole.

Fourth Turret Face: Idle.

2nd Holding

Work held in three-jaw chuck clamping on turned diameter.

First Turret Face: Rough turn spark plug tube, rough bore locating seat, core drill spark plug tube, face end of spark plug tube.

Front Cross Slide: Straddle face top and bottom of flange (Rough top and semi-finish bottom).

Second Turret Face: Finish turn spark plug tube, finish bore locating seat, finish ream spark plug tube, finish face end of spark plug tube and turn radius.

Rear Cross Slide: Straddle face top and bottom of flange (Semi-finish bottom and finish top) Finish dowel diameter.

Third Turret Face: Thread spark plug tube.

Fourth Turret Face: Idle.

3rd Holding

Work held in special air operated fixture using locating seat bored on second machine to insure true running and held back by spark plug tube threads.

First Turret Face: Semi-finish form combustion chamber, semi-finish turn outside diameter, cut gasket groove.

Second Turret Face: Finish form combustion chamber, turn sleeve clearance.

Front Cross Slide: Finish turn junk ring groove in diameter. Rough turn ring groove, finish turn relief.

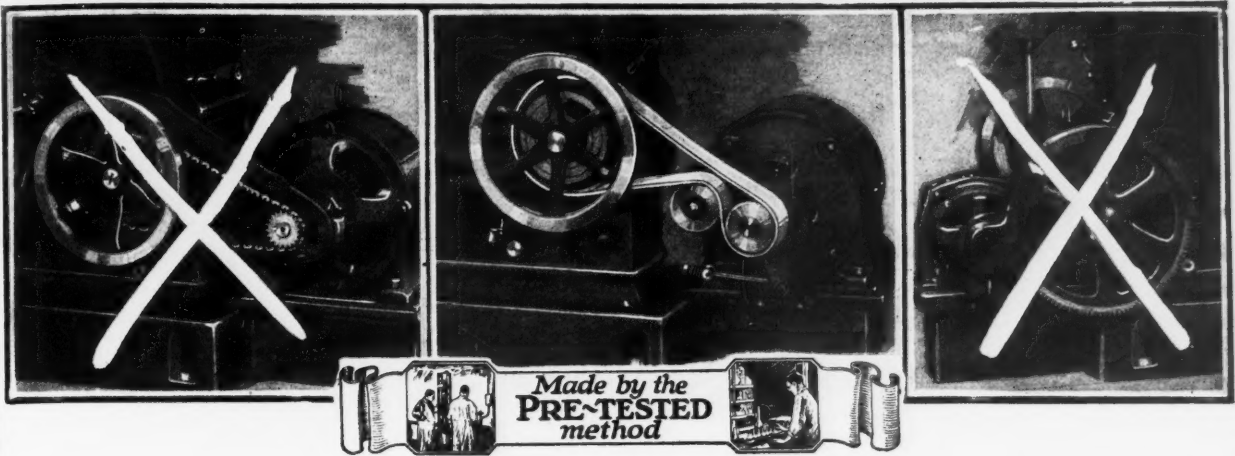
Rear Cross Slide: Finish face bottom of flange, turn dowel relief, finish turn width of ring and junk ring grooves.

Third Turret Face: Finish turn outside diameter, finish form radius on end of head.

Parts, Prints or Specifications of Your Own Work Will Allow Us to
Give You Production Figures of Interest.

POTTER & JOHNSTON MACHINE COMPANY
PAWTUCKET RHODE ISLAND, U. S. A.

REPRESENTATIVES IN THE PRINCIPAL CITIES OF THE WORLD



Hook the motor to the machine with a Chicago Belting leather belt Better than chains, gears or speed reducers

For motor driven tools

On machine tools operated with an individual motor *connect the motor to the work with a Chicago Belting leather belt.*

A motor with a Chicago Belting leather belt is a better piece of equipment than a motor direct connected with speed reducers, chains or gears.

It makes the drive more flexible. It protects both the motor and machine.

To repair a motor is quite a job and takes considerable time. To repair a belt is a matter of but a few minutes.

If anything happens to the machine or the work—if the machine jams—or something goes wrong,—then the belt takes the punishment—and *saves the motor and the machine from damage.*

A motor with a belt is the ideal equipment. That is the consensus of opinion of the engineers of the leading machine tool builders.

For such motor drives the Chicago Belting

Company can provide a belt *built for the work* by the pre-tested method that will be highly dependable and the last word in leather belt construction.

For other and internal belt drives

We can supply you a belt that is scientifically manufactured to be the best belt for *each* of your machine tool drives.

It will be tanned RIGHT FOR THAT DRIVE. It will be made for that drive.

It will last longer. Require fewer take-ups. Require less attention.

Require replacement less often. AND AID MATERIALLY THE DESIRED PERFORMANCE OF THE MACHINE.

A leather belt made for the work by the pre-tested method of the Chicago Belting Company operates perfectly.

It runs smoothly—without bumping—without trouble.

It operates with from 98½% to 99% efficiency.

Chicago Belting Company

NEW YORK BOSTON PITTSBURGH CLEVELAND CHICAGO ROCKFORD
Manufacturers of Leather Belting
127 NORTH GREEN STREET
CHICAGO, U. S. A.
NEW ORLEANS LOS ANGELES SAN FRANCISCO PORTLAND ORE SEATTLE WASH ATLANTA

Chicago Belting

Coupon—



Made by the pre-tested method



Chicago Belting Company, 127 N. Green St., Chicago.

We understand you have a new catalog and belting reference book containing the latest engineering data and practical maintenance information on leather belting and also complete information on the different tannages and your *pre-tested method* of manufacture. Entirely without obligation on our part you may send us a copy.

Name

Company

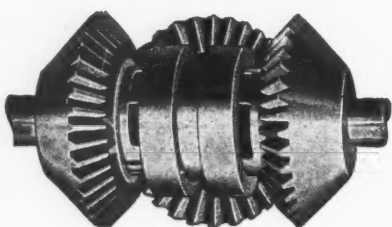
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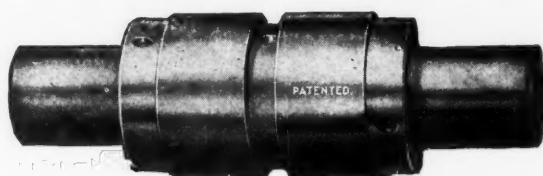
THE JOHNSON FRICTION CLUTCH

as used on the

72" Heavy Duty Betts Fixed Rail Tire Mill

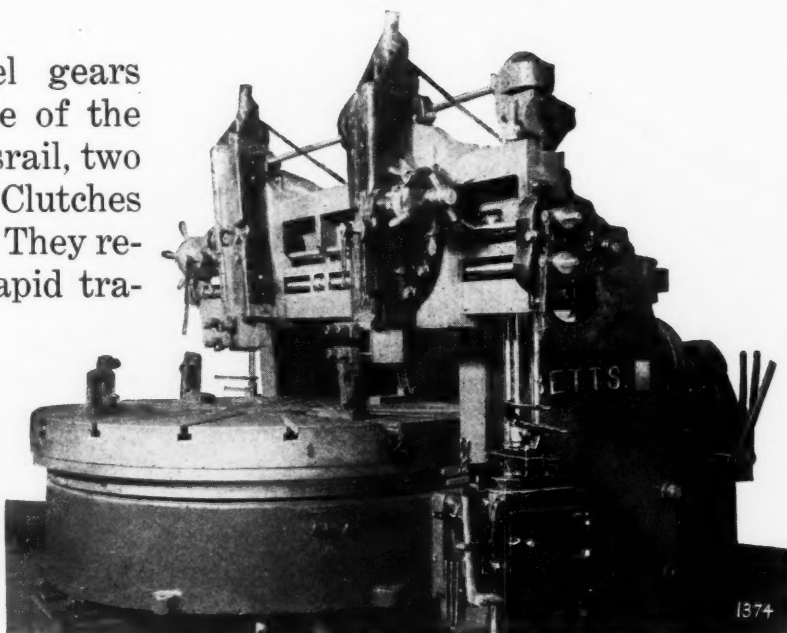


Johnson double clutch
between bevel gearing.



Double Clutch—Exterior

Installed between bevel gears and located on each side of the machine, in back of crossrail, two No. 4 JOHNSON Double Clutches are used on this machine. They reverse feed and power rapid traverse.

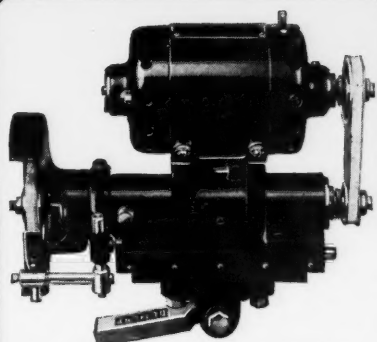
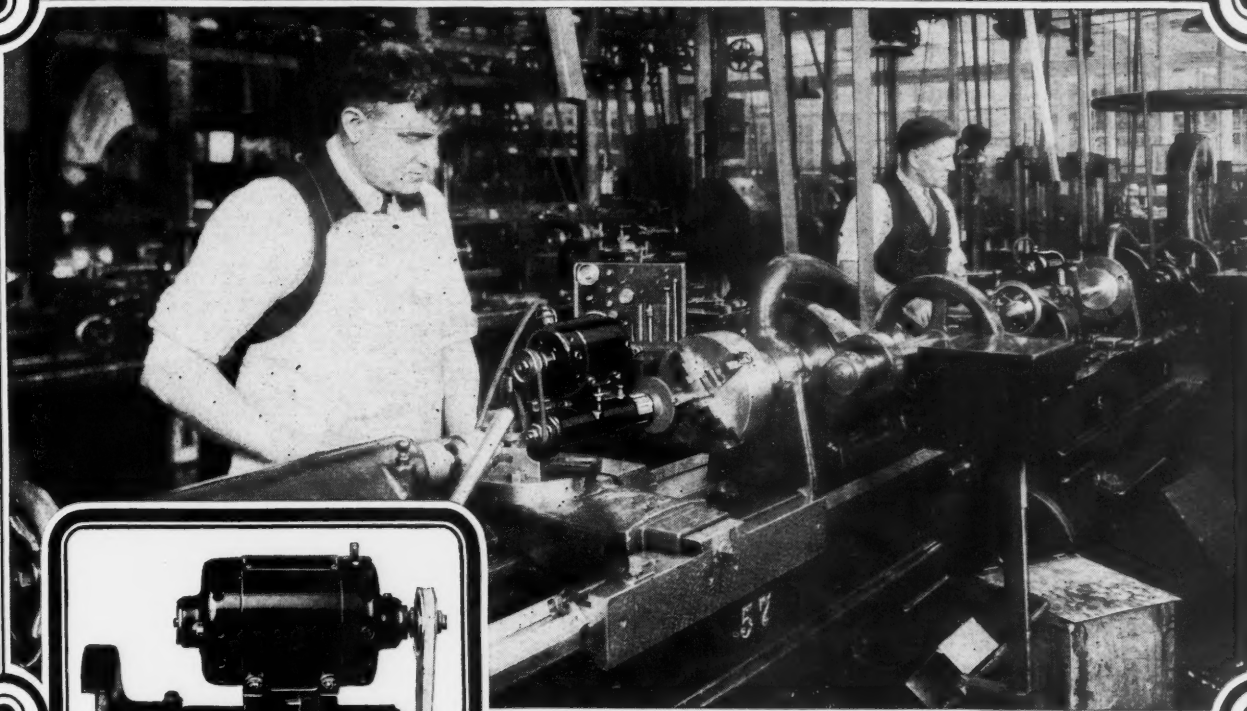


Courtesy: Consolidated Machine Tool Corporation of America, Rochester, N. Y.

Highly satisfactory service is being given by the JOHNSON Clutch on six different sizes of the Betts Tire Mill, the 66, 72, 84, 96, 100 and 108-inch. Quarter of a century's experience has qualified us to produce exactly the right clutches for these machines—rugged, powerful, capable, nicely-balanced, long-lasting clutches. Our data shows countless machines with the clutches thereon, 70,000 illustrated reprints. Write us your requirements; then we act. Equip with JOHNSONS.

Write for Catalog "A"

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.



*Dumore, No. 3 Multi-Speed Grinder.
Furnished complete with tool
and wheel equipment*

One Standard of Accuracy

YOUR reputation for accuracy of work and your volume of production; two influential factors in your business, can be greatly improved with Dumore Grinders.

Exacting grinding jobs, internal and external, on large pieces and small, are easier to handle if you use Dumore Grinders. To turn out more and better work many manufacturers have installed whole batteries of Dumore Grinders. The economy, durability and accuracy of this equipment are paying them big dividends on the investment.

Send for our latest booklet showing the application of Dumore Grinders to many uses, a Free tap drill chart and details of our exchange offer. Use the coupon.

DUMORE

*High Speed Electric
Toolpost Grinders*

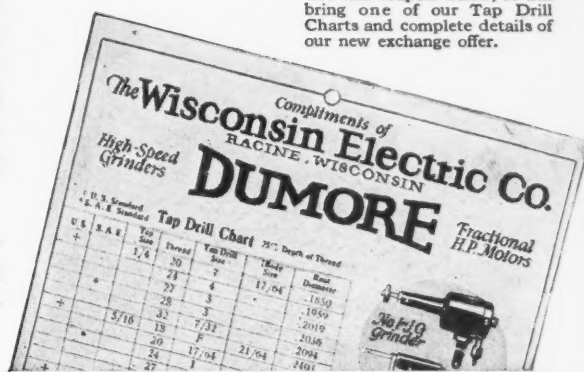
Mail the Coupon—It will bring a Free Tap Drill Chart and complete details of our trade-in plan.



Dumore Grinder Advantages

There are six Dumore Grinders with individual speed ranges from 3,600 to 50,000 R.P.M. Correct speed without vibration, eliminates taper, bell-mouth and chattermarks, common with less efficient tools.

Use the coupon below, it will bring one of our Tap Drill Charts and complete details of our new exchange offer.



FILL IN CAREFULLY

Wisconsin Electric Company, 25 16th St., Racine, Wis.

Please send me Free, a Tap Drill Chart, your latest grinder booklet and tell me what allowance you will make on the Grinder I have now. This grinder is—

(Insert make and model of Grinder you have on this line)

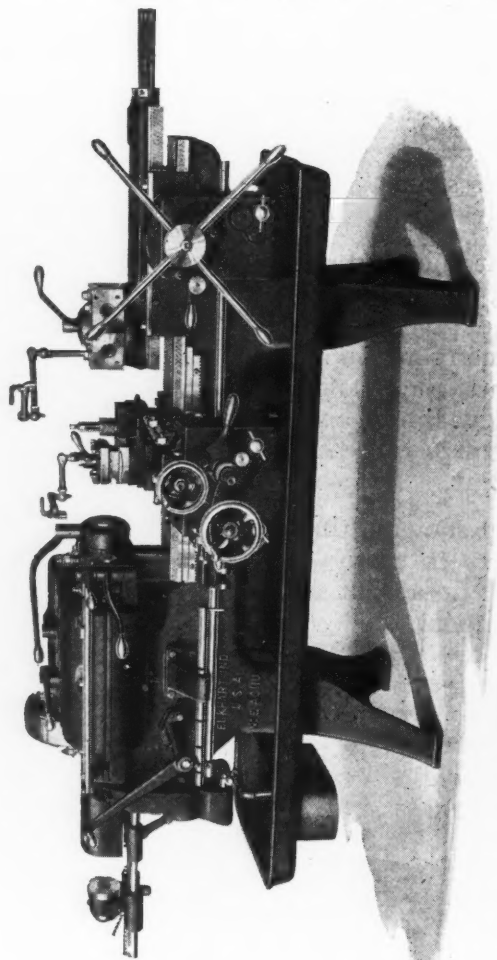
Name.....

Address.....

City..... State.....

The new **FOSTER** No. 5 Universal Turret Lathe

Swing over bed 17", Bar Capacity 1 13/16, Turning Movement 11"



Vee Ways

stand the gaff for years on engine lathes, they always hold the carriage in alignment. That is why you find them on the New Foster No. 5 Universal.

The Power Feed Carriage Apron

is of the double apron type and through an all steel gear train six power feeds are available from centralized control to the cross slide, and longitudinal movements of the carriage. All feeding movements automatically stopped.

An All Steel Geared Head

with every gear machined from an alloy steel forging, heat treated, with eight spindle speeds and a heat-treated spindle running in special bronze bearings. The number of spindle speeds, the design, the material, are proven correct through the past and present practices.

Multiple Disc Clutches

with hardened steel discs having eight to ten times the frictional area of the ordinary cone type are used throughout. They last longer, require fewer adjustments and are easier operated. All spindle speed changes without stopping the machine.

Centralized Control

to carriage and saddle apron feeds and to spindle speeds means rapid manipulation and added production capacity to both machine and operator.

The multitude of varieties of work that can be handled on this machine is an assurance of continuous earning capacity. It is an ideal machine for the small shop as well as the large—Our catalog gives a complete and illustrative description. Our engineers will give you production figures.

Send for the No. 5 Universal Catalog.

The Turret Slide and Saddle

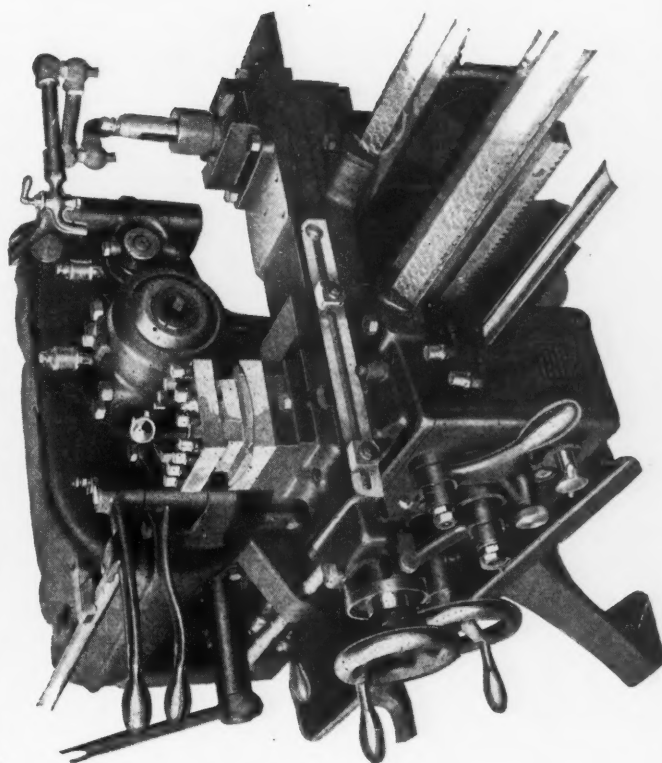
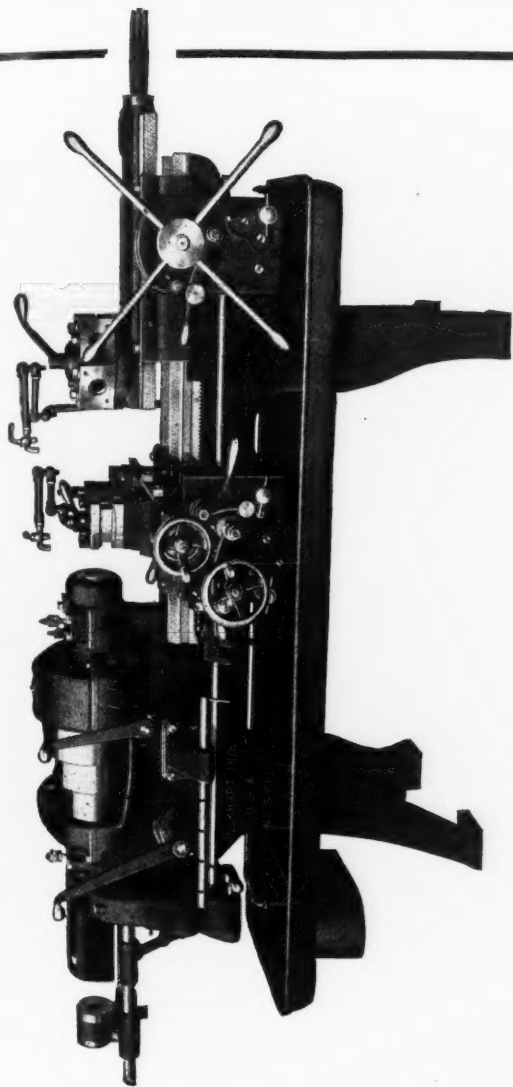
with semi-chilled bearing surfaces, six power feeds through an all steel gear train enclosed in a double apron. Every constructive part is proven correct through past and present machine construction and design.

The Automatic Chuck

is of the master collet type with the final closing movement effected through a toggle action, simple, quick, easily operated and affords an extraordinarily powerful gripping action.

The Bar Feed

is operated by the same lever operating the automatic chuck. No extra movement on the part of the operator is required to feed the bar for ordinary lengths—this is another feature adding productivity to both operator and machine.



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Indianapolis, Ind. |

FOSTER MACHINE CO., Elkhart, Indiana, U. S. A.

RAPID PRECISION CENTERING MACHINE

Centering of parts made on automatic machines can be performed simply, rapidly and with money-saving accuracy with the Hanson-Whitney Rapid Precision Centering Machine. Money-saving because accurate centering saves waste, time and labor on subsequent finishing operations.

Four work holding chucks are furnished to accommodate work up to 1 11/16" dia. — larger sizes to order.

Parts may be inserted, centered and removed very rapidly — shapes of considerable complexity are securely held.



SEND FOR COMPLETE
DESCRIPTION



The Hanson-Whitney Machine Co.
Hartford, Conn.

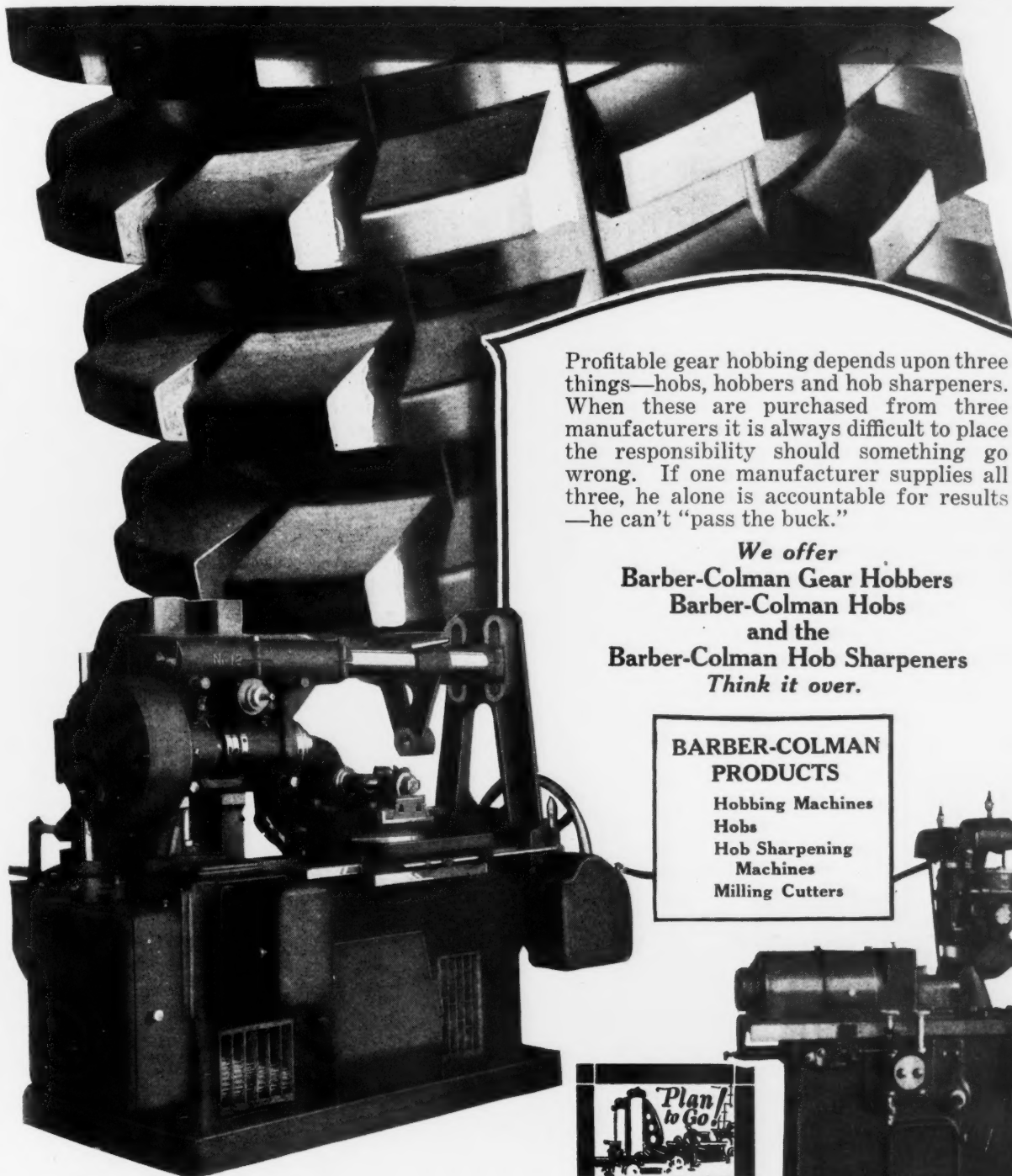
DOMESTIC REPRESENTATIVES:—New York, N. Y., L. C. Biglow & Co., Inc.; Syracuse, N. Y., George McPherson; Philadelphia, Pa., D. J. Normoyle; Pittsburgh, Pa., William K. Stamets; Cleveland, O., William K. Stamets; Cincinnati, O., Seifreut-Elstad Mch. Co.; Dayton, O., Seifreut-Elstad Mch. Co.; Detroit, Mich., A. G. Brice; San Francisco, Calif., A. H. Coates Co.; Chicago, Ill., E. H. Huntington; Toronto, Ont., Canada, Arthur Jackson.

FOREIGN REPRESENTATIVES:—London, England, Leo C. Steink; Rotterdam, Holland, R. S. Stokvis & Zonen, Ltd.; Stockholm, Sweden, Rylander & Asplund, Maskinforsalning A-B; Paris, France, Fenwick Freres & Co.; Turin, Italy, Fenwick Freres & Co.; Brussels, Belgium, Fenwick Freres & Co.; Barcelona, Spain, Fenwick Freres & Co.; Rio de Janeiro, Brazil, Fenwick Freres & Co.; Zurich, Switzerland, Fenwick Freres & Co.; Tokyo, Japan, Andrews & George Co.; Sydney, Australia, H. P. Gregory & Co., Ltd.





Profitable Gear Hobbing



Profitable gear hobbing depends upon three things—hobs, hobbers and hob sharpeners. When these are purchased from three manufacturers it is always difficult to place the responsibility should something go wrong. If one manufacturer supplies all three, he alone is accountable for results—he can't "pass the buck."

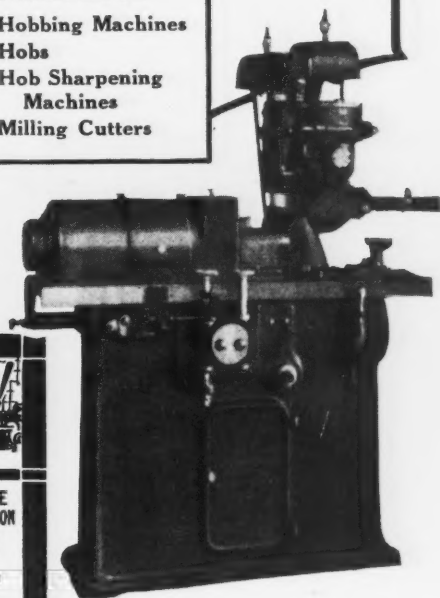
We offer
Barber-Colman Gear Hobbers
Barber-Colman Hobs
 and the
Barber-Colman Hob Sharpeners
Think it over.

BARBER-COLMAN PRODUCTS

Hobbing Machines
 Hobs
 Hob Sharpening
 Machines
 Milling Cutters

BARBER-COLMAN COMPANY

General Offices and Plant
Rockford, Ill., U. S. A.





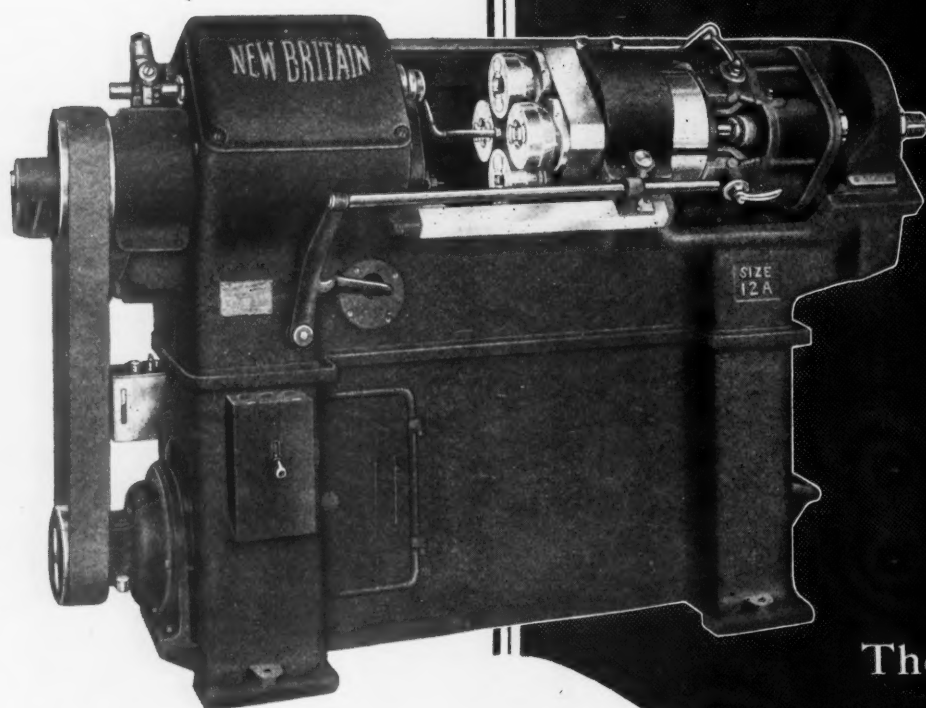
New Britain

No. 12A Chucking Machine

An advanced design of chucking machine of tool rotating type with high spindle speeds and quick acting air chucks for the rapid, automatic machining of small brass, steel and iron castings, forgings and second operation work. Productions up to 2400 per hour.

Brief Specifications

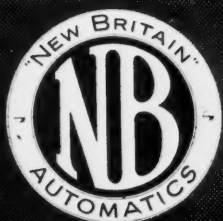
Three Spindles	Four Chucking Positions
Chuck sizes	collet chucks $5\frac{1}{2}$ " dia.
	two jaw chucks 6" long
Bore spindle	No. 1 and No. 2 1" dia. x $2\frac{1}{4}$ " deep
noses	No. 3 $2\frac{15}{16}$ " dia. x 1" deep
Adjustment of turret to or	from spindles 4"
Stroke of spindles inclusive of	jump 1" to $2\frac{1}{2}$ "
Weight	3700 lbs.



The two machines illustrated are part of a full line of chucking and screw machines made by us for producing high quality parts in cost reducing time.

The New Britain
New Britain

CHUCKING



Super Production

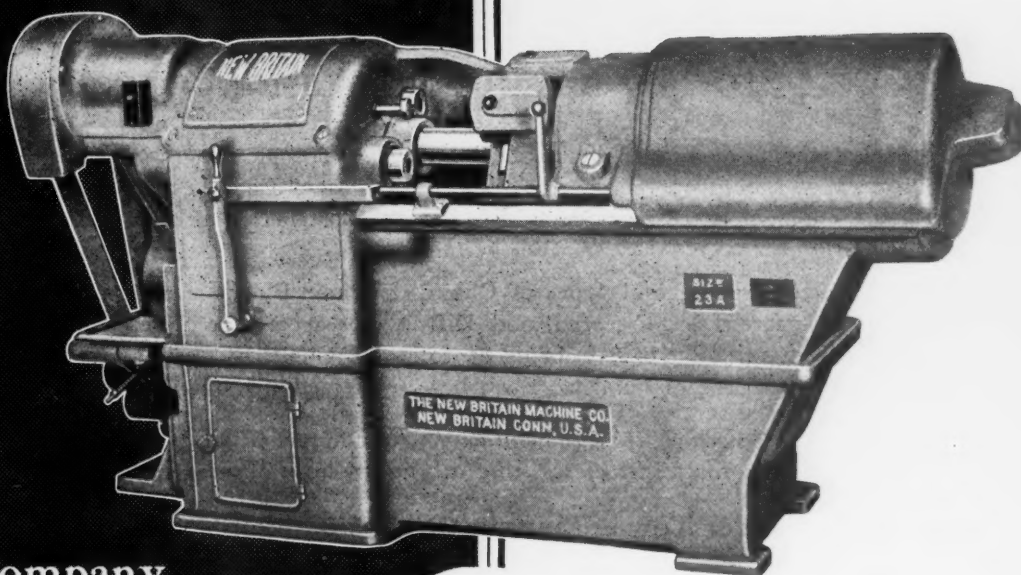
No. 23A Chucking Machine

A new Multiple Spindle Automatic Chucking Machine of Tool Rotating type, air controlled, with high spindle speeds and rapid index. Like all New Britain Automatics, super-production of high quality work is the key-note. Production up to 1250 per hour is well within its capacity.

Brief Specifications

Four Spindles Five Chucking Positions
7" 2 Jaw Screw Operated Air Chucks
Spindle Bores, 1st, 2nd and 3rd
positions $1\frac{1}{2}" \times 3\frac{3}{8}"$ deep, 4th $1\frac{1}{4}" \times 3\frac{3}{8}"$ deep
Turret Adjustment 5" to or from spindles
Spindle Stroke 3" jump and feed inclusive
Weight 7000 lbs.

Bulletins on these and our full line of chucking and screw machines are available. Complete details and data regarding the machines and the type of work is included.



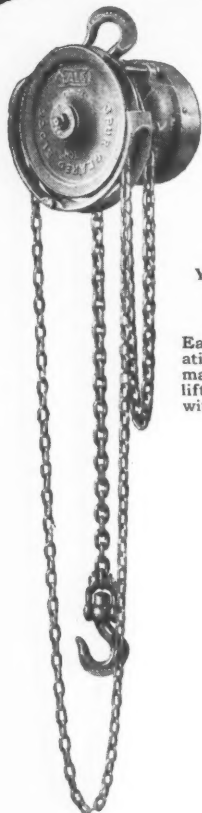
Machine Company
Connecticut

MACHINES

TRADE

YALE

MARK



1

Yale Ball-bearing
Spur-gear
Chain Block

Easy and safe operation. All parts Yale-made. One man can lift a load of 1 ton with one hand.



2

Yale Screw-gear
Chain Block

For portable use. Light, powerful, takes up less head room. A pull of 87 lbs. on hand chain lifts a 1 ton load.



3

Yale Differential
Chain Block

Made with the same care and precision as the Yale Spur-gear and Screw-gear Chain Blocks. Embodies strength and security and is the easiest operated differential block on the market.

YALE makes CHAIN BLOCKS for every purpose and capacity

The selection of the proper chain block for your purpose should not be an occasion for off-hand judgment or too-quick decision. Get the facts.

Yale makes three general types of Chain Block—Spur-gear, Screw-gear, and Differential. They are alike only in being up to Yale's high standards of quality. Each has

its specific uses in specific situations and purposes. Each is a masterpiece in design and construction for that purpose.

Every sales representative handling Yale Chain Blocks is anxious to give the benefit of his experience in determining first what type of Chain Block is correct for you. Price or immediate profit to him is secondary.

Ask the Yale representative who calls on you, or write direct for folder describing all Yale Chain Blocks in detail.

The Yale & Towne Manufacturing Co., Stamford, Conn., U. S. A.
Canadian Branch at St. Catharines, Ontario



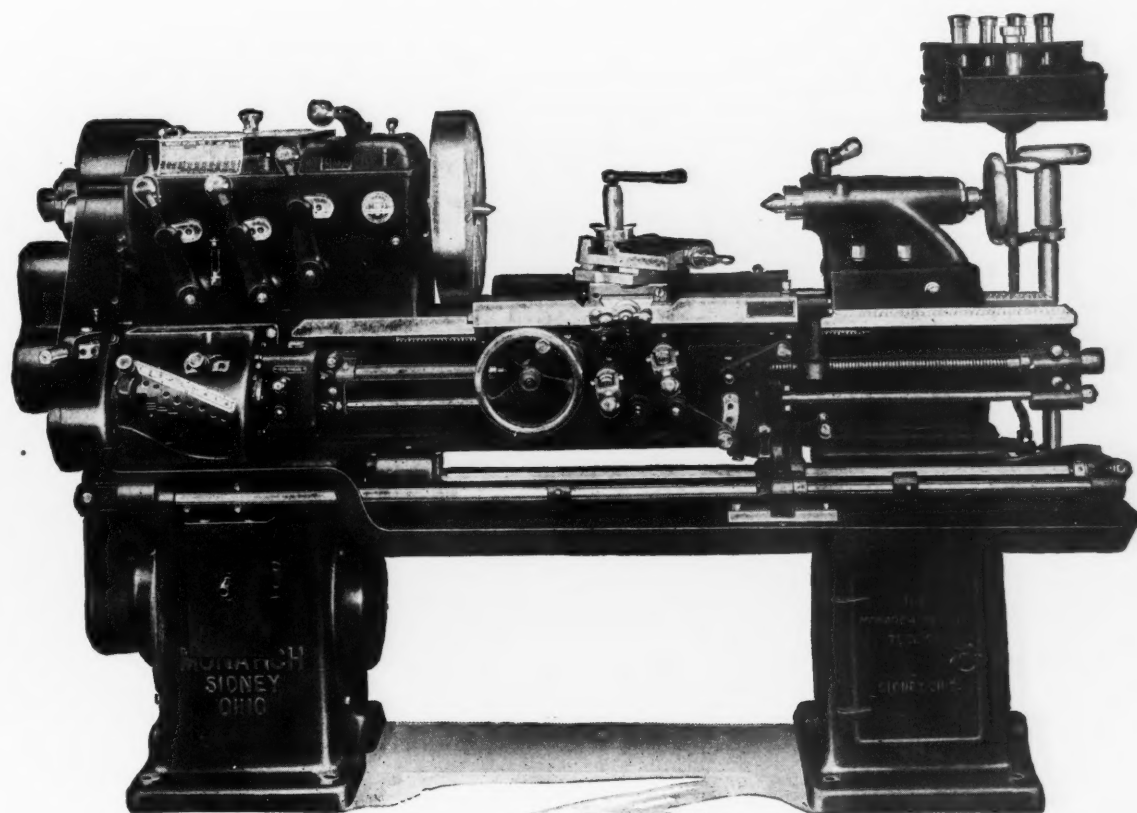
YALE MARKED IS YALE MADE

Hoisting and Conveying Systems

Why MONARCH Helical Geared Lathes *cut production costs*

1. Helical Headstock Gears. Silent, Smooth, Powerful.
No gear tooth marks on work.
2. Fast changes of spindle speeds.
3. Fast, non-slipping apron feed control levers (Patented).
4. Multiple disc clutch, dual control, instant starting and stopping of spindle.
5. Centralized controls, operator handles all controls without moving from his normal working position.

*Only in Monarch Helical Geared Lathes
Are All These Essential Features Found*



16-in. x 6-ft. Monarch Helical Geared Complete Tool Room Lathe

Silent — *Smooth* — *Powerful*

THE MONARCH MACHINE TOOL COMPANY

Sidney, Ohio

NEW YORK OFFICE, 857 Graybar Bldg.

Super-Strom

*Feature
Number 3*

Extra deep race grooves

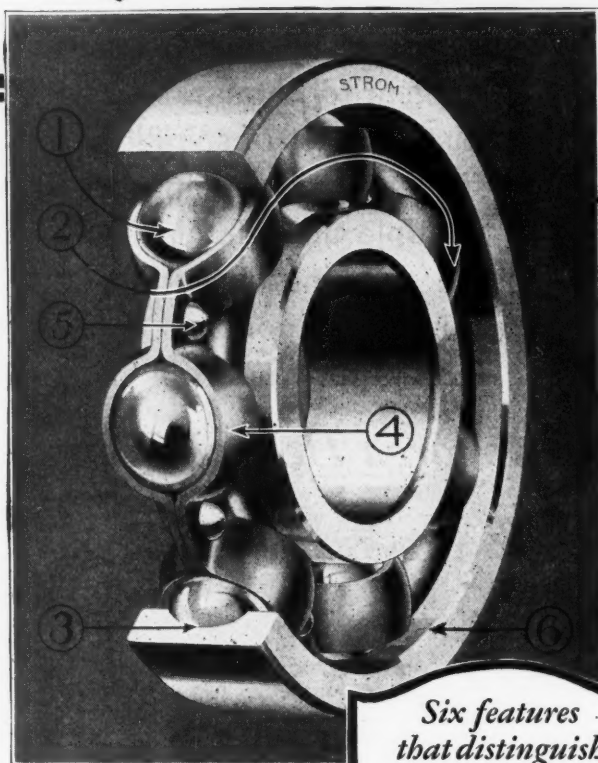
Continuous service without the necessity of adjustments, maximum radial capacity, and ability to carry thrust loads in either direction are obtained in the Super-Strom bearing by the use of deep race grooves, accurately formed to the contour of the extra-large molybdenum steel balls.

STROM BEARINGS CO.

4563 Palmer Street, Chicago, Ill.

CLEVELAND PHILADELPHIA
SAN FRANCISCO

DETROIT CINCINNATI
SPRINGFIELD, MASS.



Six features that distinguish Super-Strom Ball Bearings

- 1 Extra large Molybdenum alloy steel balls.
- 2 Maximum number of balls possible without filling slots.
- 3 Deep race grooves.
- 4 Retainers pressed from heavy gauge steel.
- 5 Sturdy button-head rivets.
- 6 Race rings of special high carbon, chrome alloy steel.

These features insure a quality bearing having exceptionally high radial load-carrying capacity — increased thrust capacity in either direction — smooth, quiet operation — and longer life.

Strom

BALL BEARINGS

Radial (single and double row) Angular Contact and Thrust Types—a complete range of types and sizes.

M8-Gray



Accuracy

ROBIN HOOD'S quivering arrows always found their mark. Why? Because he spent his lifetime training himself to be accurate.

For over a third of a century it has been the goal of "Cleveland" to produce automatics unequalled for their precision. That they have ably succeeded is adequately proven by thousands of installations in a score of prominent industries where over a long period of years "Clevelands" have been the standard when close limits were required.

In these days when narrow margins of profit are the rule, spoiled work takes on a new significance. You can no longer afford to have inspectors rejecting a costly share of each day's work.

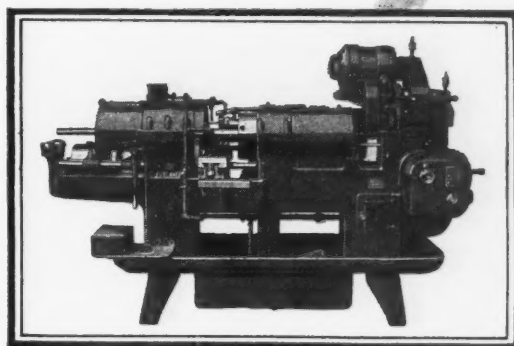
Our engineers will gladly show you how greater profits can be obtained from your automatic department. Don't wait. Write us now, and let us help you to get the edge on your competitors.

THE CLEVELAND AUTOMATIC MACHINE CO.
Cleveland, Ohio, U. S. A.

NEW YORK
95 Liberty St.

CHICAGO
565 W. Washington Blvd.

DETROIT
1217 Book Bldg.



Holding to Size

Day In and Day Out

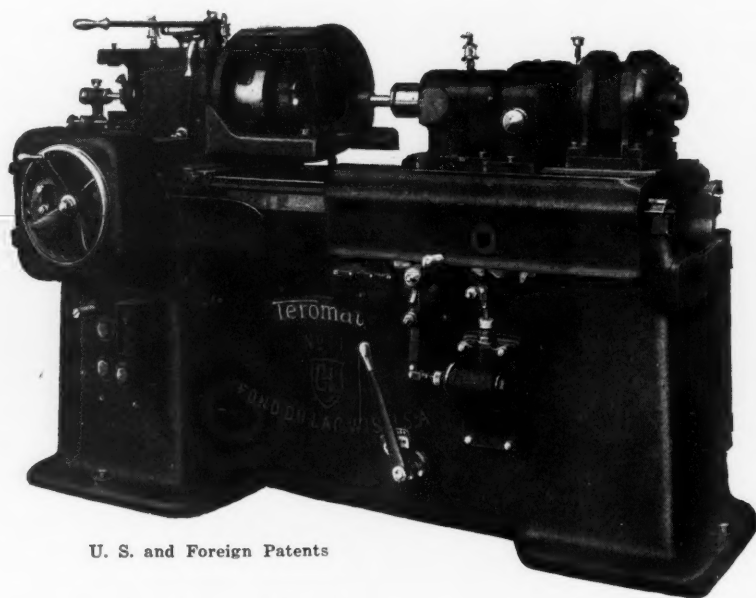
Positive
Automatic
Gaging

Every Hole Alike.
Maximum Production
Negligible Scrap.

There is Only One Way to Get Steady, Continuous Accuracy in Grinding

That one way is to provide a positive gaging of every piece, based entirely on the exact diameter of the finished hole. That is accomplishing a lot, but when it is done automatically, as on the G & L Teromatic, maximum production is the result. The Teromatic Gaging device is positive and reliable not only under favorable conditions, but holds to size regardless of variations in wheel wear, hardness of material or stock to be removed.

The Teromatic



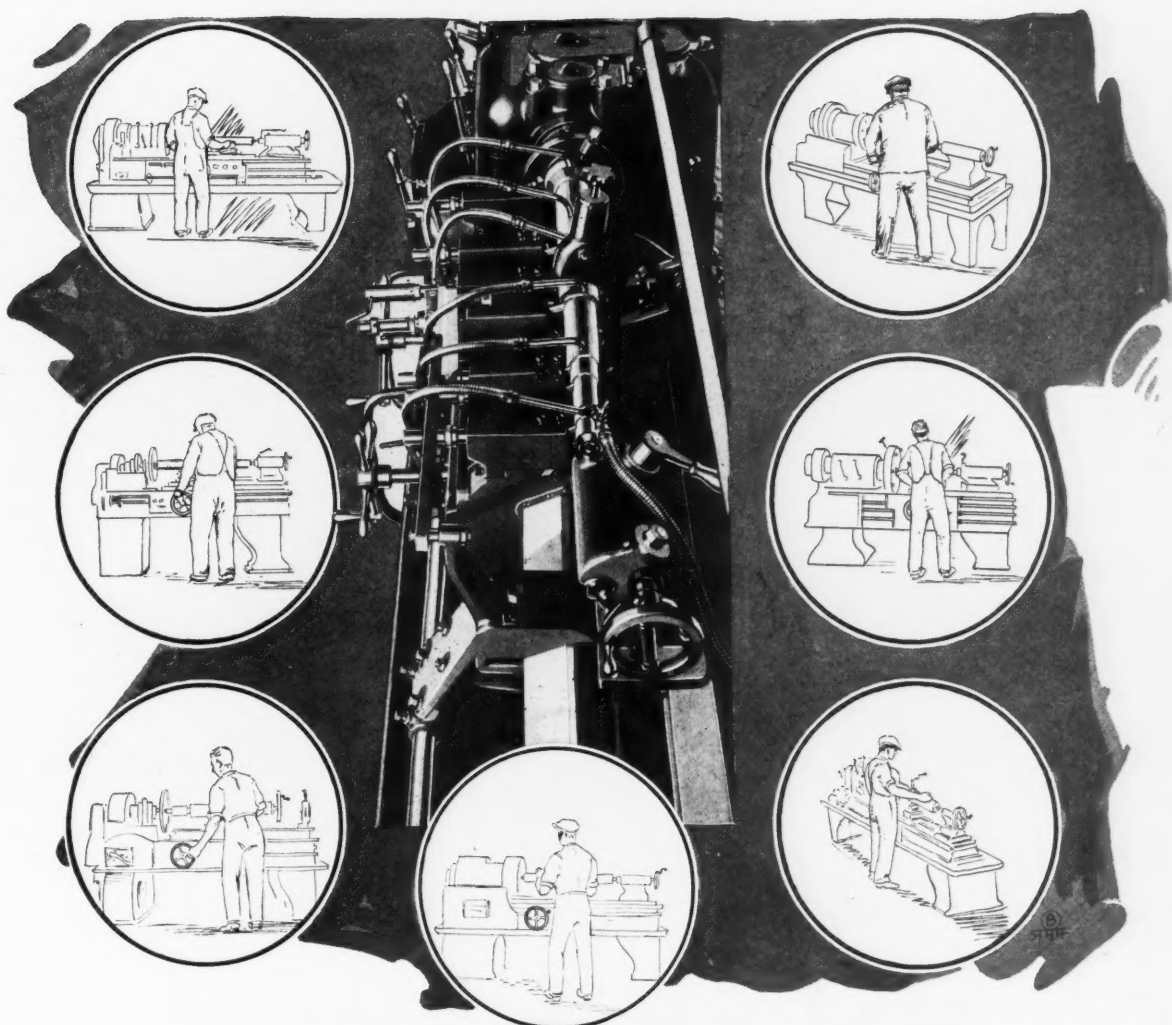
U. S. and Foreign Patents

The Pioneers in Automatic Internal Grinding

GIDDINGS & LEWIS MACHINE TOOL CO.

Founded 1859

FOND DU LAC, WISCONSIN



Seven Lathes in One

*also Seven Operations Simultaneously performed and all by
Only One Operator*

THE last word in modern cost reduction. Less floor space—less power—less men—less investment—more production—more profit—better work. Those who are able to produce their product at such unbelievable figures are using this method to lower their costs.

Have you seen and read our interesting bulletins?

Send blue prints of such jobs as you are turning for our figures of saving by doing it the Lo-Swing way. This service is free of obligation.

SENECA FALLS MACHINE CO.,

The Lo-swing People

SENECA FALLS, N. Y.

District Sales Manager for Michigan and Ohio:

W. H. Nettle, 236 Richton Avenue, Highland Park, Detroit, Michigan.

District Sales Manager for Wisconsin, Illinois and Indiana:

John A. Camm, 662 - 48th Street, Milwaukee, Wisconsin.

European Office:

42 Rue le Peletier, Paris 9e, France, in charge of George E. Fogarty, European Sales Manager.

—The Lo-swing— METHOD

Newly developed tooling makes Lo-Swing method savings available on small lot production. Even single pieces can now be turned at a lower cost. There is a Lo-Swing that will fit your requirements. Why not investigate?



Do you know the advantages of making it by the wrought process?

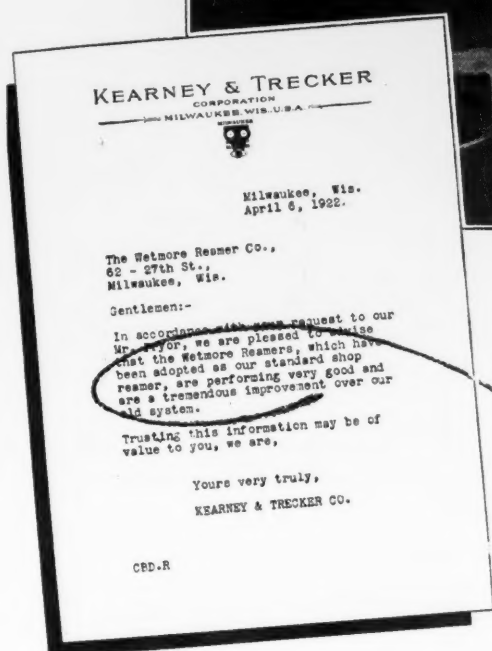
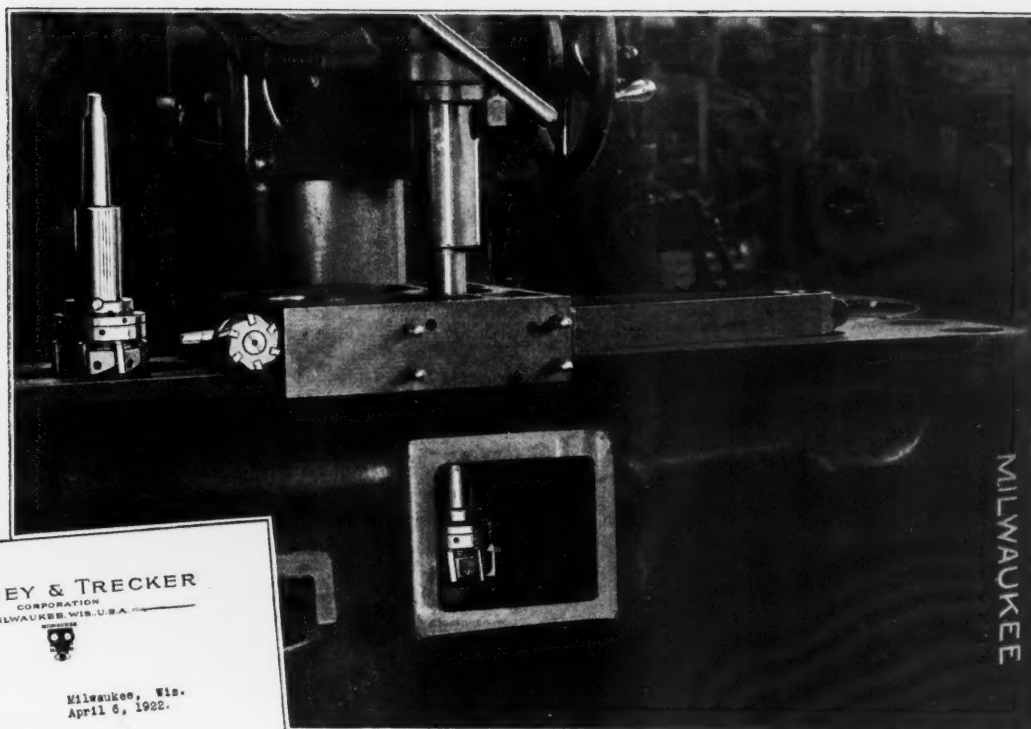
NO product or a part of it is so perfect that it cannot be improved. It is the business of this company to develop by test and analysis the most suitable brass for the use of critical manufacturers. As specialists in the production of wrought brass articles by cupping and drawing we can give you the benefit of tried and proved methods. The deep drawing process has marked advantages resulting in a stronger, more uniform product. It leaves a smooth finish on the brass, cutting the time on finishing operations. It gives a better article generally at lower cost. Our methods are original and up-to-date, as shown by our own volume production of cupped and drawn articles of all sizes and designs.

Our engineers will be glad to work with you on your brass problems. In so doing you need feel under no obligation.

BRIDGEPORT BRASS

- COMPANY -

Bridgeport, Conn. • New York • Philadelphia • Chicago • Detroit • Cleveland



KEARNEY & TRECKER

Makers of famous MILWAUKEE Milling Machines

have standardized

on WETMORE REAMERS since 1922.

FOR years, Wetmore Adjustable Reamers have been standard equipment in the great plant of Kearney & Trecker, manufacturers of the famous Milwaukie Milling Machines.

In April 1922, Kearney & Trecker wrote us the letter shown at the left. Illustrated above is their latest Wetmore Reamer equipment, purchased only recently.

Year after year, Wetmore Adjustable Reamers, of practically every type, have faithfully served this well-known manufacturer. Unusual accuracy, greater speed and dependability, and maximum economy have established this preference for Wetmore, "the Better Reamer."

WETMORE REAMER COMPANY
60-27th Street MILWAUKEE, WIS.

The shop view shown above illustrates Wetmore Shell Reamers, Type No. 7, at work on a MILWAUKEE Milling Machine in the Kearney & Trecker plant, Milwaukee. (This sturdy Reamer is illustrated and described on Page 12 of the new Wetmore catalog.)

WETMORE

ADJUSTABLE REAMERS

"THE BETTER REAMER"

AJAX

FORGING ROLLS

*for Speed in
Straight and Tapered Draws*

THIS piece is an excellent example of the drawing that can be done by Ajax Forging Rolls.

In order to fill out the head of this forging in the steam hammer dies, it is necessary to use $1\frac{3}{4}$ " billet stock, leaving a heavy block to be drawn out into the long, slender shank.

By ordinary methods, using a steam or trip hammer, this drawing would be slow and expensive, but with a No. 2 Ajax Forging Roll the $\frac{7}{8}$ " round shank 30" long is drawn, straight and accurate as rolled stock, at a speed abreast of the steam hammer forging the eyes.

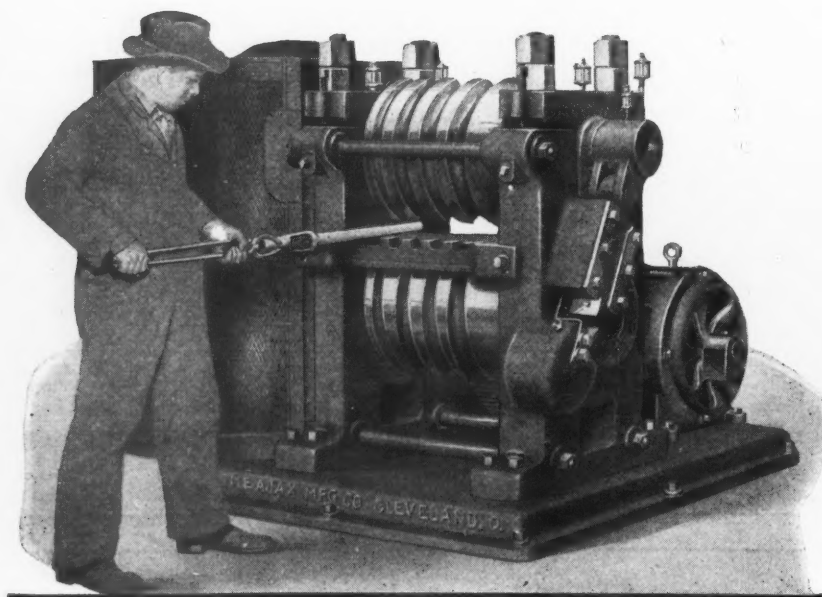
Tapered shanks can be drawn as easily as straight, square or rectangular as easily as round, and in all cases the finish is clean and smooth, free from irregularities, flash and hammer marks.

Our Bulletin No. 42-A describing the numerous uses of these machines will be gladly sent you upon request.

THE AJAX MANUFACTURING COMPANY

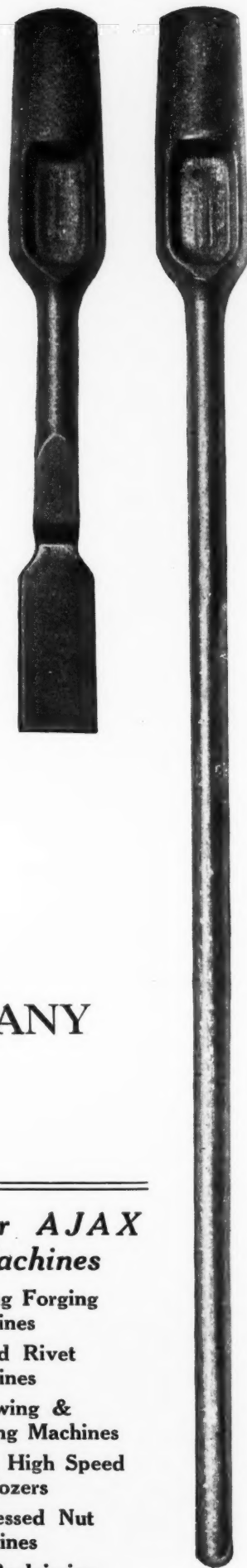
Euclid Branch P. O., Cleveland, Ohio

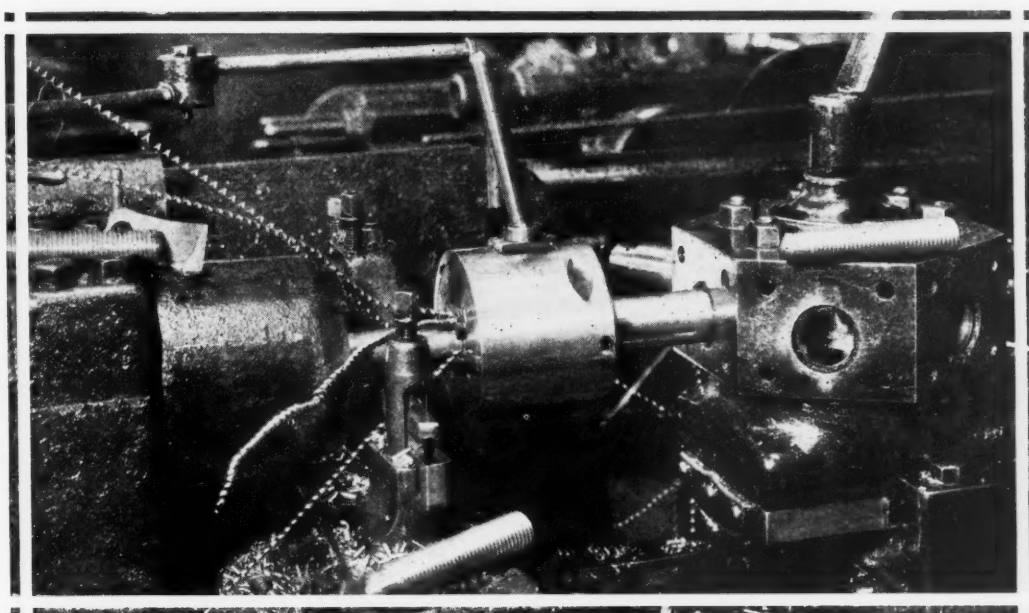
621 Marquette Building, 140 South Dearborn St., Chicago, Ill.
1369 Hudson Terminal, 50 Church Street, New York City



Other AJAX Machines

Upsetting Forging
Machines
Bolt and Rivet
Machines
Hot Sawing &
Burring Machines
Slow & High Speed
Bulldozers
Hot Pressed Nut
Machines
Scrap Reclaiming
Rolls





Namco Opening Dies Cut Metal The Way Metal Should Be Cut

When the Namco Opening Die was designed it was considered in the light of what any die must primarily be—a refined type of metal cutting tool.

As a result of this reasoning Namco Chasers—which are the actual cutting tools—strictly follow the laws upon which success in the art of cutting metals depends. In the first place they are made from the right kind of steel, scientifically tempered. They are accurate in thread form and lead and are backed off and ground to insure clean free cutting upon the particular metal involved.

Namco Opening Die Heads “back up” accurate Namco Chasers as thoroughly as the finest modern production machine tools back up their cutting tools. The

chasers are held to their work rigidly and with unvarying accuracy in pitch diameter, and they are instantly and unfailingly released at the exact point where the thread should terminate. They are as precise and snappy in their action as the finest repeating rifle and at the same time will keep pace day in and day out with the most rugged machine tools under extreme production conditions.

The unposed, unretouched photograph shown herewith tells a graphic story of the Style S Namco Opening Die as an efficient metal cutting tool on a record run of clean accurate screws in a big production shop. Style S is for stationary die spindles and Style R for revolving die spindles. Capacities range from $\frac{1}{8}$ " to $2\frac{1}{2}$ ".

The National Acme Company
Cleveland, Ohio Windsor, Vt.

New York

Detroit

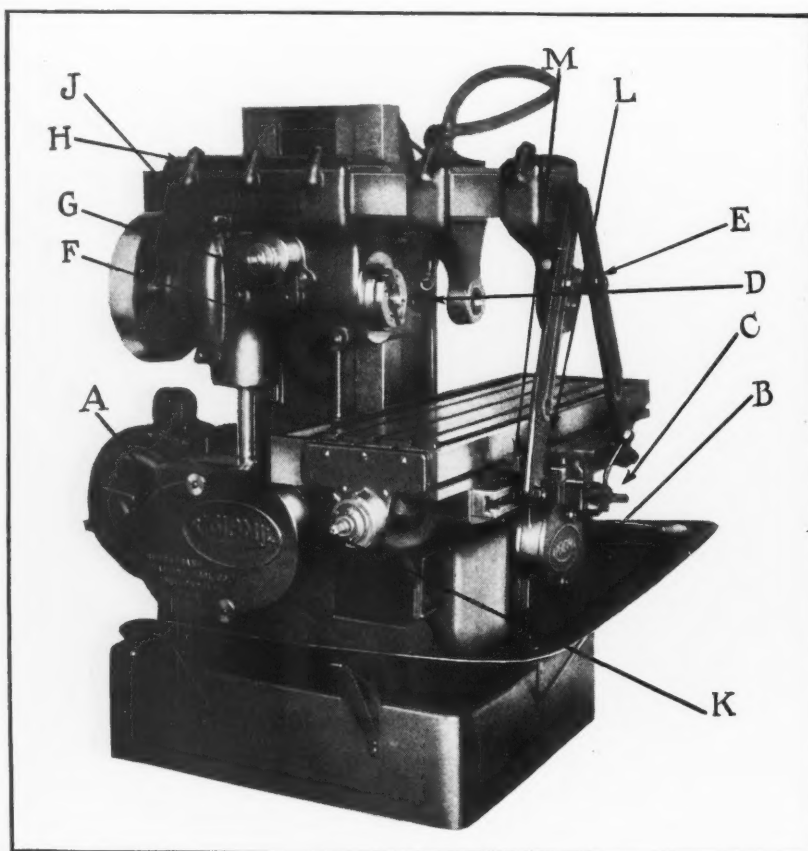
Chicago

Makers of Acme and Gridley Multiple Spindle Automatics, Gridley Single Spindle Automatics and Gridley Multiple Spindle Chucking Machines at Windsor, Vermont, and Namco Opening Dies, Collapsing Taps and Screw Machine Products at Cleveland, Ohio.

Correct Principles

Adjustments—Few—Accurate

A Good Set-up Is One Easily Made



Spindle Speed Changes are easily made by changing Pick-Off Gears under Cover "A" which holds them in place on ends of 4-key integral spline.

Table Feed Changes are easily made by changing Pick-Off Gears under Cover "B" which holds them in place on 4-key spline.

Height Adjustment of Spindle Head is made by rotating Micrometer Graduated Shaft "C" with Crank after Clamp Bolts "D" have been released and Harness Bolts "E" are loosened.

Endwise Adjustment of Spindle is made by releasing binding nut "F" and by rotating Micrometer Graduated Shaft "G" with crank.

Endwise Adjustment of Overarm is made by loosening Clamp Nuts "H" and by rotating Shaft "J" with Crank.

Table is Positioned by rotating Micrometer Graduated Screw "K" with Crank.

Table Travel is adjusted by properly locating Trip Blocks "L". Table is positively stopped by Safety Stops "M".

Automatic Tripping from Feed into Rapid Traverse can be accomplished by Special Table Control Mechanism.

A GOOD SET-UP MAN HAS NO FEAR
A FEW MINUTES' WORK AND HE GOES



TIMKEN EQUIPPED

Sundstrand Machine

Simplified—Accurate High Precision

ROCKFORD, ILL.

of Design—No. 6

Accurate and Accessible

ly Made and One That "Stays Put"

Spindle Speed Changes are easily made by changing Two Ratio Change Gears under Cover "A".

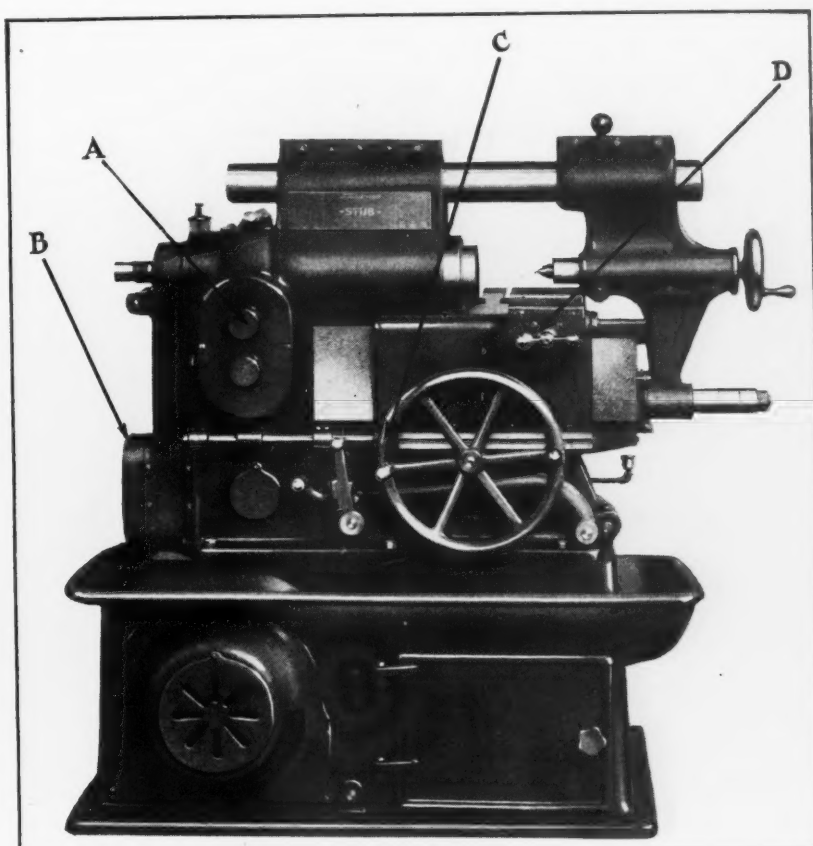
Front Carriage Feed Changes are easily made by changing a pair of Gears under Cover "B".

Rear Carriage Feed Changes are easily made by changing a pair of Gears under a similarly accessible Cover at Rear of Machine.

Travel of Front Carriage is determined by location of Stop Collars "C" which disengage Feed.

Travel of Rear Carriage is determined by Ratio and Arrangement of Rear Change Gears.

Accurate Setting of Tools depends upon design of Special Tool Holders employed.



On Machine of Standard Design the diameter adjustment of Front Tooling is controlled by Micrometer Crank Handle D. The Rear Tooling may be positioned by locking Tool Holder in correct position in Slide.

Tools of Each Slide are independently adjusted by individual adjustment Screws.

AR OF THE RIGIDMIL OR STUB LATHE
DES AWAY CONFIDENT THEY WILL PERFORM

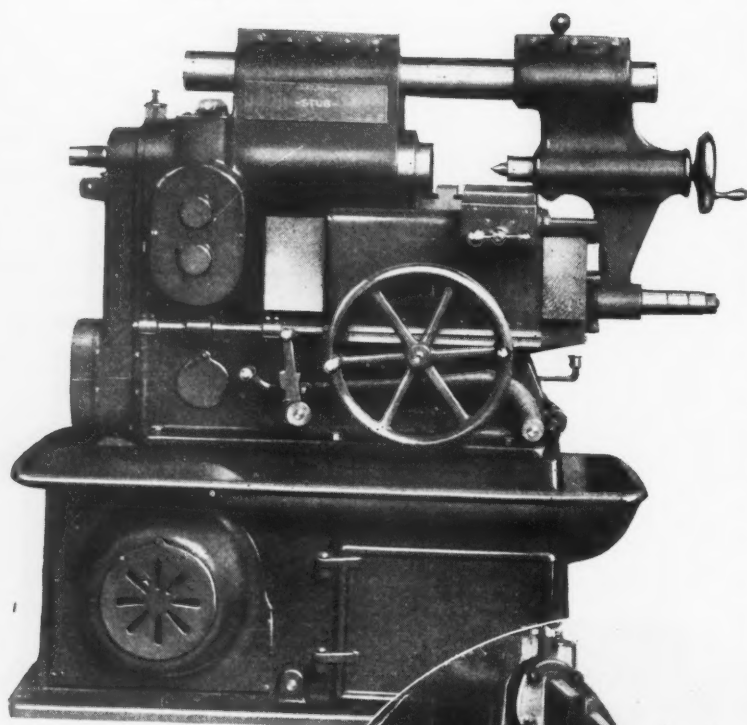
Machine Tool Co.

High Production Machine Tools

ILLINOIS, U.S.A.



Applications of Cor r



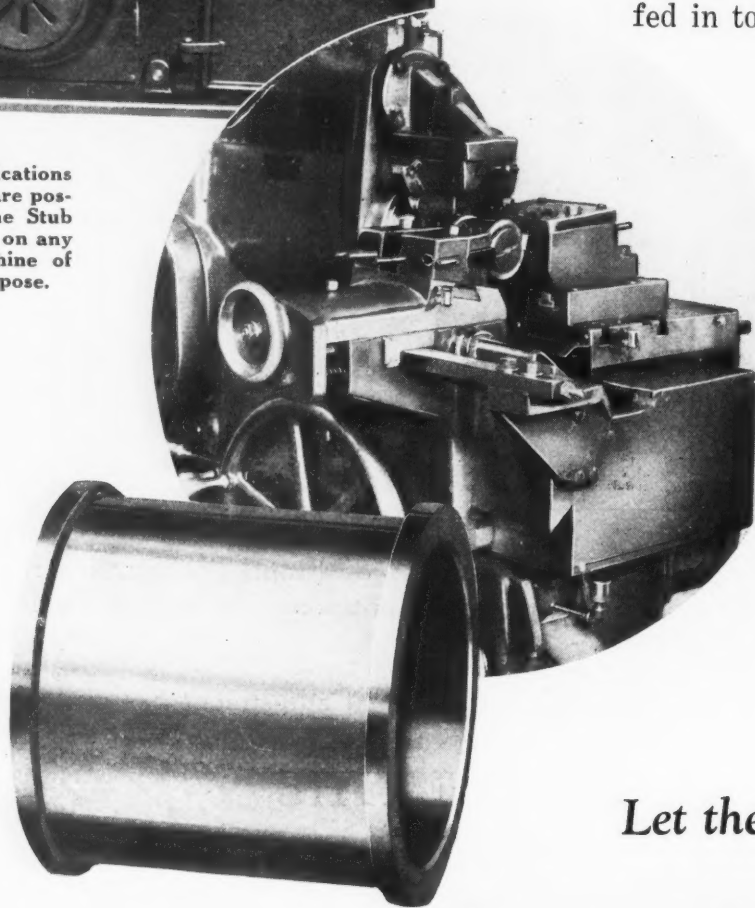
More applications of tooling are possible on the Stub Lathe than on any other machine of similar purpose.

Machining Main Bearing Bushings

The material is bronze and the operation is to turn the outside diameter of the bushings, turn outside diameter and face both sides of the flanges, and chamfer both ends of bore. The part is held on an air-operated expanding mandrel and located by means of a swinging stop from the tool block on the overarm.

All the tools cut simultaneously and are fed in to the required depth automatically. The longest cut is approximately 3" and the actual cutting time is 25 seconds.

The setup is especially interesting because a tool slide is mounted on the overarm, which is actuated through a rack and gear from the rear slide and permits the chamfering of the bore in both ends of the bushing simultaneously with the turning, and in one chucking.



Let the Sundstrand Production



Sundstrand Mac

Simplified-Accurate High Pr

ROCKFORD IL

Correct Principles No. 6

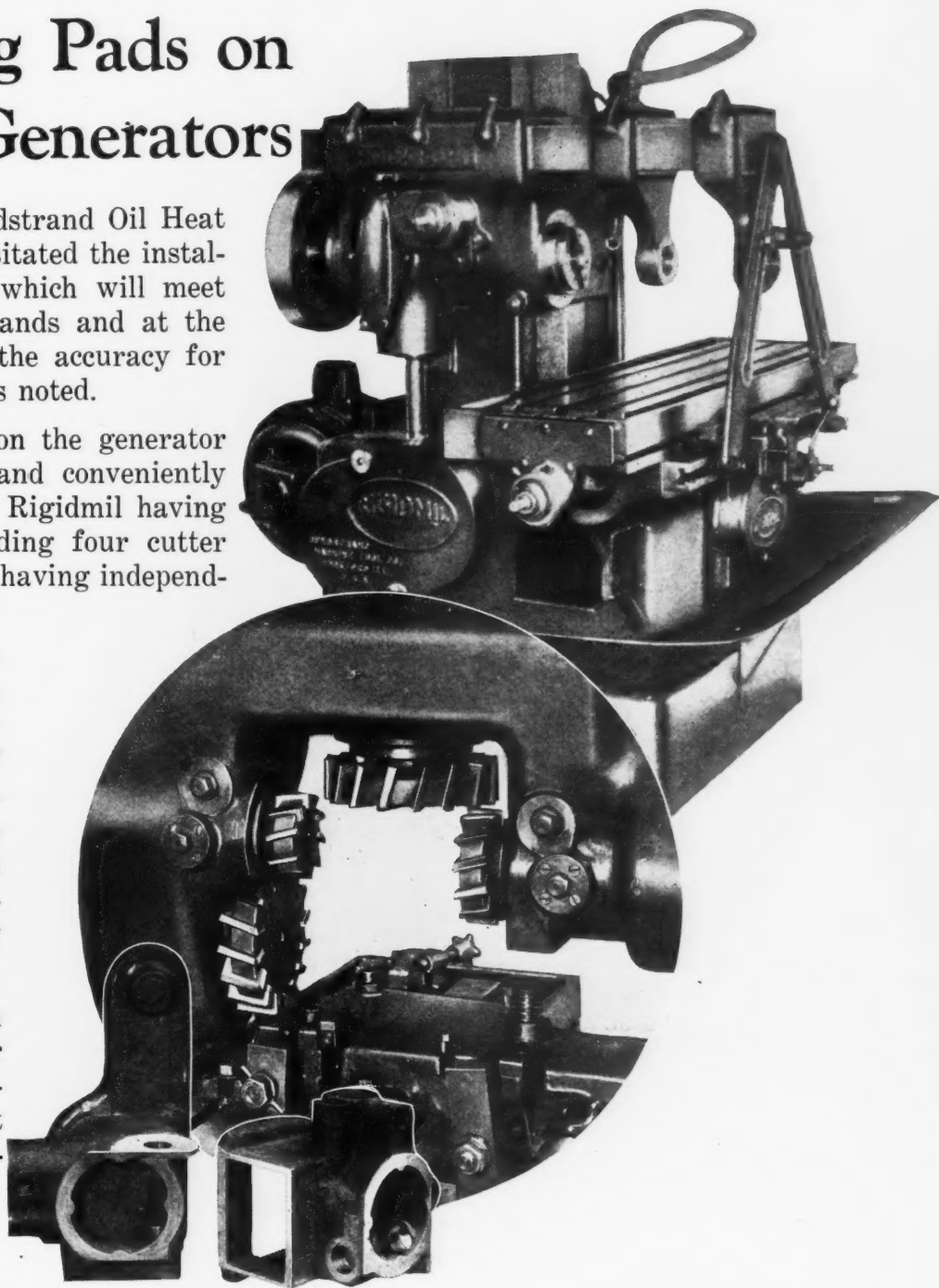
Machining Pads on Oil Heat Generators

The demand for Sundstrand Oil Heat Generators has necessitated the installation of equipment which will meet their production demands and at the same time maintain the accuracy for which their product is noted.

Here the four pads on the generator base are accurately and conveniently milled on a standard Rigidmil having a special head providing four cutter spindles, each spindle having independent adjustment.

Here again is special machine production on a standard Rigidmil and protection of the investment because—remove the special head and you have a standard machine ready for any plain milling job.

Table height from floor, 32"—ideal for handling work. Reduces physical effort of operator to minimum.



ion Proposal Engineers assist you

Machine Tool Co.

igh Production Machine Tools

ILLINOIS, U.S.A.



TIMKEN EQUIPPED

Thor

Announces Induction Type Motor-180 Cycle ELECTRIC DRILLS

*Light, Powerful and Speedy
—They Introduce A New
Era of Efficiency*

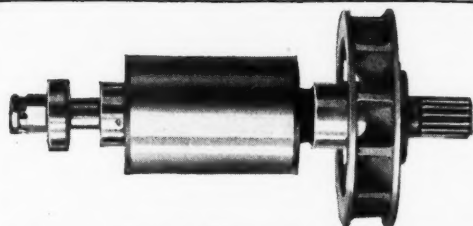
Here is an entirely new line of Electric Tools, designed and built along new and improved principles, and operating on 180 cycle current.

Their construction is extremely simple, as the type of motor employed eliminates the use of commutator and brushes. The THOR Rotor is made of solid copper bars, riveted and welded in position *and has no revolving wires*. These two important features do away with the frequent servicing required on Electric Tools heretofore used.

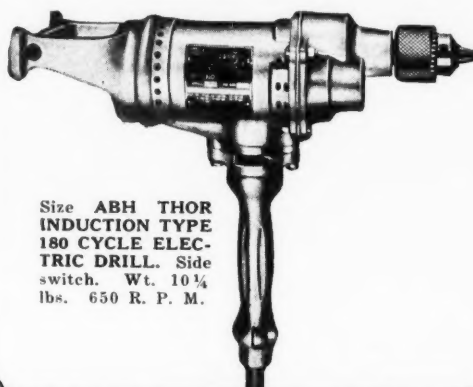
Another big advantage that THOR INDUCTION TYPE 180 CYCLE ELECTRIC TOOLS have is that they are exceptionally speedy. But what is more important, **THIS SPEED IS CONSTANT**. From no load to peak load THOR INDUCTION TYPE DRILLS maintain the same high rate of speed. They are unusually light in weight and are easily handled.

It was only natural for THOR, with a background of 34 years experience as toolmakers, to take a leading part in the development of High Frequency Tools. Our reputation, which has been built up through these many years, is the heritage of every tool in this new line, and assures you positive satisfaction.

To use High Frequency Tools it is necessary to install a Frequency Changer to step up the current to 180 cycles. However, if you are using ten or more portable tools, it will be to your advantage and profit to write to us for complete information.



This is the THOR ROTOR which eliminates the use of commutators and brushes in THOR INDUCTION TYPE 180 CYCLE ELECTRIC TOOLS. Built of solid copper bars, riveted and welded in position. **NO LOOSE OR REVOLVING WIRES**. Mounted on ball bearings. Gears are made of special high grade steel to withstand gruelling service.



Size ABH THOR INDUCTION TYPE 180 CYCLE ELECTRIC DRILL. Side switch. Wt. 10 1/4 lbs. 650 R. P. M.

TOOLMAKERS SINCE 1893

INDEPENDENT PNEUMATIC TOOL Co.
PNEUMATIC TOOLS GENERAL OFFICES ELECTRIC TOOLS
600 W. Jackson Blvd.
CHICAGO

FACTORY AURORA, ILL.

Eastern Office 1463 Broadway, New York



BRANCHES THE WORLD OVER

London Office 40 Broadway, Westminster, London

A Cutting Edge You Can't Wear Out

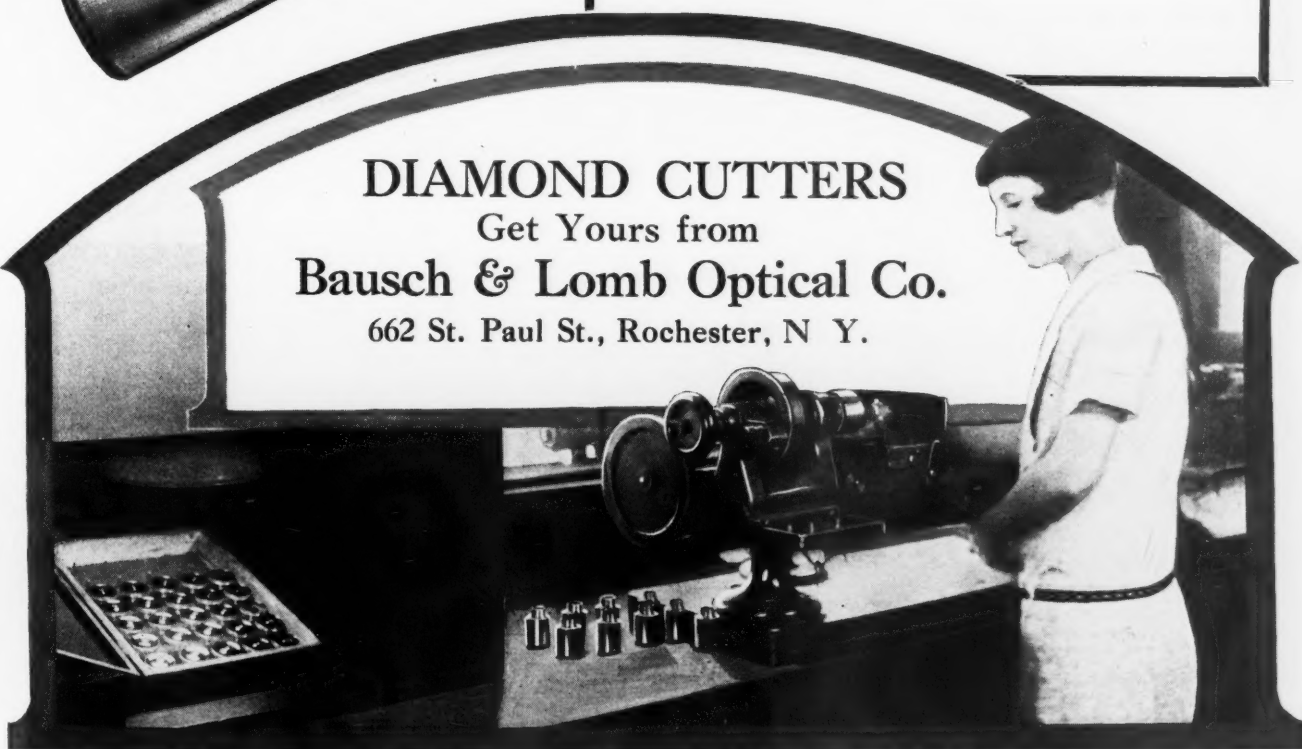


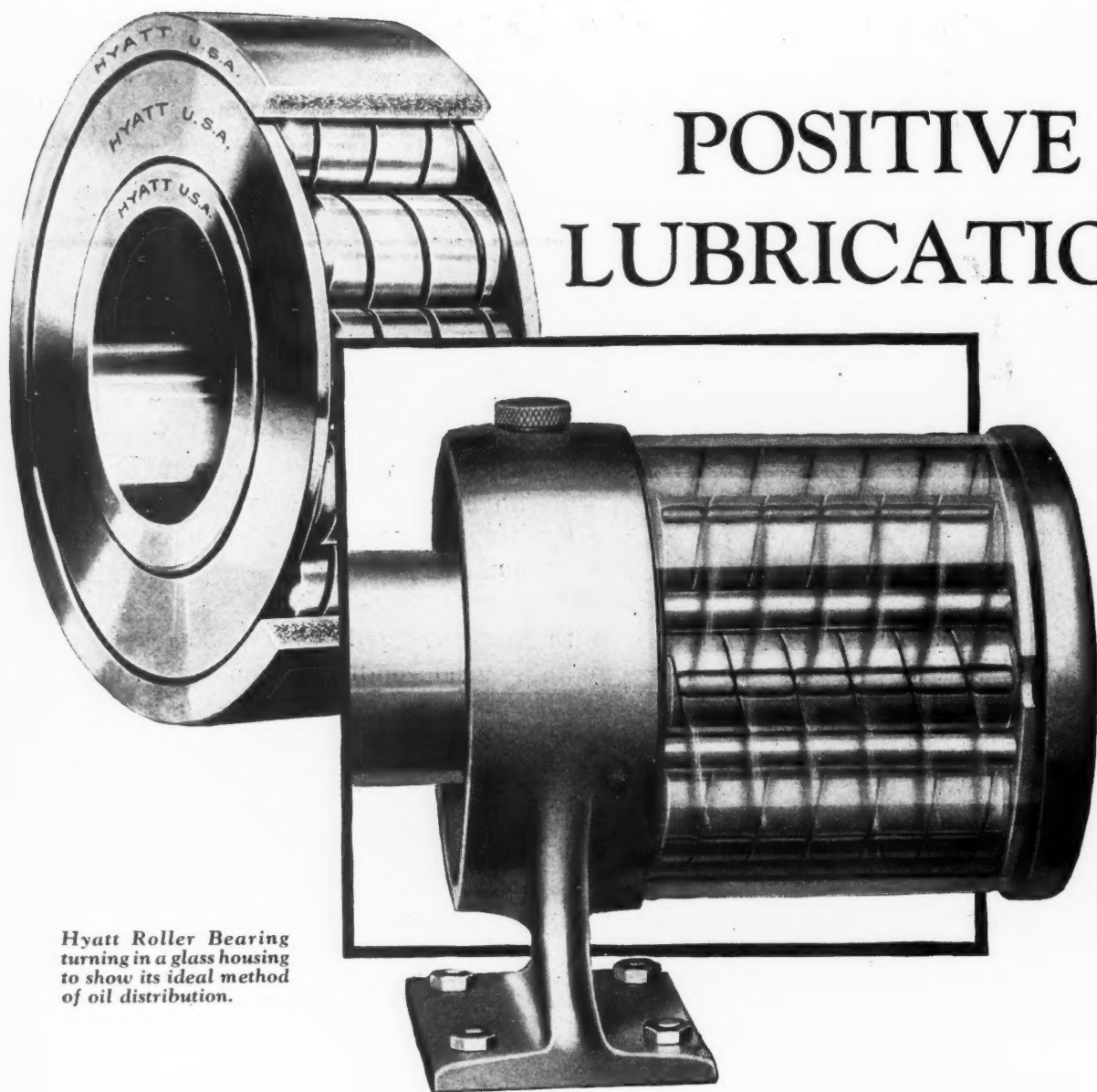
When it comes to a total of advantages, Diamond Cutters have no equal. They can be used on most metals, they cut with extreme accuracy, they leave a beautifully finished surface, they have a long life and they are offered at an economical price.

With proper care Diamond Cutters remain in good condition indefinitely and require practically no regrinding. In a specific instance, one of our cutters was used continuously for eighteen months turning brass tubing, and at the end of that time needed no regrinding.

Diamond Cutters pay for themselves many times over in better work, increased production and cutter savings. Why not try them?

DIAMOND CUTTERS
Get Yours from
Bausch & Lomb Optical Co.
662 St. Paul St., Rochester, N. Y.





POSITIVE LUBRICATION

Hyatt Roller Bearing
turning in a glass housing
to show its ideal method
of oil distribution.

THE helical construction of the right and left hand, alternately assembled, Hyatt rollers keeps the oil in constant motion. This insures cool running bearings and extends their life immeasurably.

Note the oil oozing out of the hollow rollers. As the bearing turns each roller leaves a trail of lubricant over every part of the operating surface — there's never a dry spot.

Hyatt housings are sealed against grit, dirt and other abrasive substances. There is practically no friction or wear. Repairs and replacements are rare. The bearings require no attention except an occasional lubrication.

Many of the best known machine tool builders use Hyatts extensively because their advantages have been universally proved in the most difficult places.

HYATT ROLLER BEARING COMPANY

Newark
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HYATT

ROLLER BEARINGS

PRODUCT OF GENERAL MOTORS

CHAMBERSBURG — NATIONAL



Sales Forces

UNIFIED

for Greater Service

Chambersburg Hammers and Hydraulic Machinery and National Bolt and Forging Machinery are now being sold through a unified sales organization.

Chambersburg-National representatives having, in this unified line, the outstanding equipment

for forging and pressing operations, are prepared to offer impartial engineering advice on any such problems.

Information regarding both lines will be cheerfully furnished from either Chambersburg or Tiffin, or from the combined branch offices in New York, Detroit and Chicago.

CHAMBERSBURG-NATIONAL

Complete Forging Equipment

CHAMBERSBURG ENGINEERING CO.
CHAMBERSBURG, PA.

NATIONAL MACHINERY CO.
TIFFIN, OHIO

DETROIT 2457 Woodward Ave.

CHICAGO 565 W. Washington St.

NEW YORK 152 West 42nd Street

CHAMBERSBURG — NATIONAL

The Cincinnati

DRILLS—GRINDERS—BUFFERS

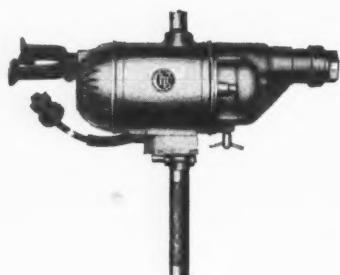
Again—Another Triumph in Drilling Efficiency

*Our 7/8" single speed drill made a big hit—
everybody knows that . . .*

Now Comes—

The Cincinnati

Two Speed 7/8" Drill



Type U-R 7/8" Two-speed
Drill.

which you've been wanting. A second set of gearing provides for the higher speeds proper for smaller diameter drills. Change in speed is made by a single shift of the lever, while tool is running.

The efficient all-purpose drill!

Get full particulars from your jobber's salesman

THE CINCINNATI ELECTRICAL TOOL CO.

2674 Madison Rd.,

Cincinnati, O.

Prominence the result of Quality



"THE ORIGINAL"
IMITATION DOES NOT ARGUE AGAINST
ACCEPTANCE IT ACCEPTS

ON ITS OWN LEGS" for the reason that it fulfills its function.

The quality of a product has much to do with its cost and the profit resulting from its manufacture.

If service is built into a product by virtue of its quality, that product will "STAND

If quality is sacrificed to meet a selling price and the necessary profit, service is paid for but not received.

Cogsdill tools are of proven worth, so much so that Drills, Reamers and Cutters bearing the name "Cogsdill" are being used as standards by which metal cutting tools are compared.



Stocked in Sizes—60 to 5/16 in.

Don't Overlook Quality
COGSDILL MFG. CO.

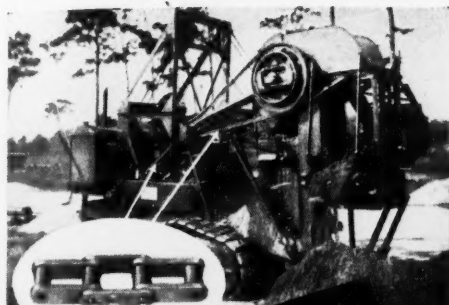
High Speed Steel
Small Diameter Drills
Center Drills

DETROIT, MICHIGAN

Send for your copy of our catalog

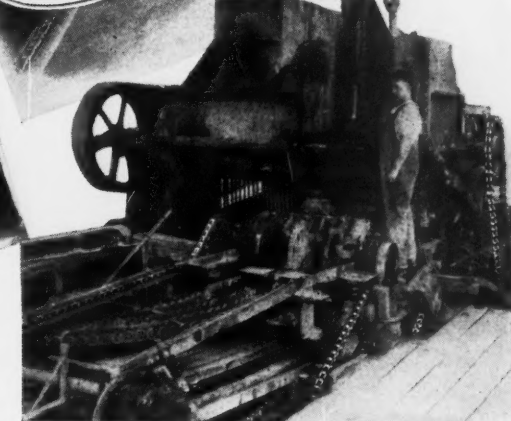
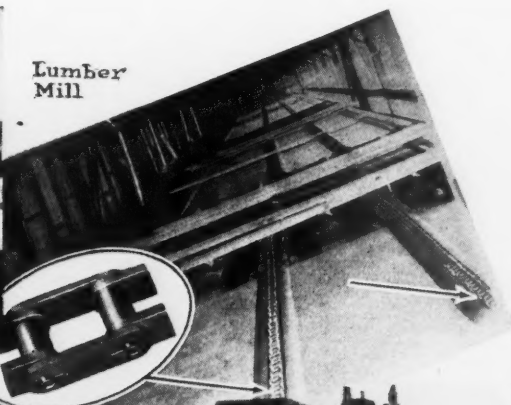
High Speed Steel
Reamers, all types
Special Tools to Drawing

Worcester Serves Marine Engineering

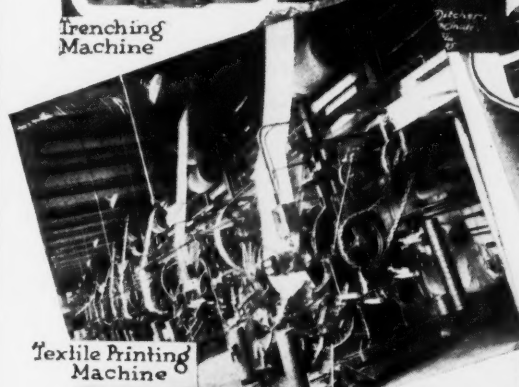


Trenching Machine

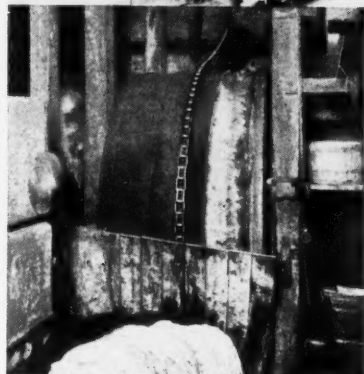
Lumber Mill



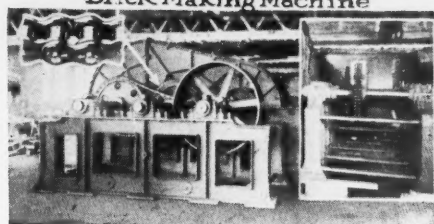
Brick Making Machine



Textile Printing Machine



Tannery Drive



Paper Mill Machinery

IN EVERY INDUSTRY

BALDWIN CHAINS

Our expert engineering service plus a dependable chain drive guarantees—SATISFACTION.

And so—if you want “no time out” for repairs, please consider Baldwin Steel Replacement Chains and Standard Roller Chains for your drive. It matters not whether your problem is the tannery, leather, paper, oil, coal, textile, lumber, candy, or a hundred others we might mention. *Bulletin 27 Gives the Whole Story.*

THE BALDWIN LINE

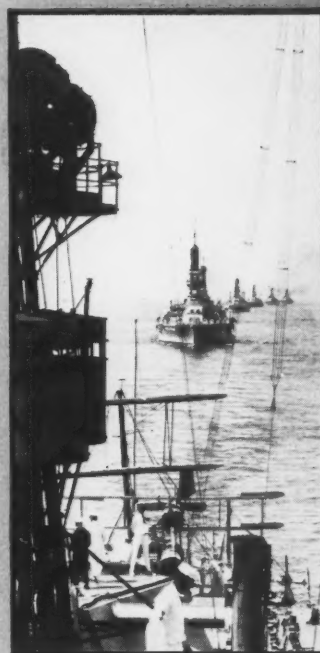
STEEL ROLLER CHAIN
STEEL REPLACEMENT CHAIN

ACCURATE SPROCKETS
PRECISION SILENT CHAIN

OIL WELL CHAIN
SPECIAL CHAINS

BALDWIN CHAIN & MFG. CO.

WORCESTER, MASS., U. S. A.



© Underwood.

A review of the finest U.S. Naval ships—from dreadnaughts to submarines—gathered in the Hudson River, provided an exhibition of the best, most modern and most efficient in naval armament.

—And Uncle Sam is a satisfied Worcester customer for much of the material and equipment for this important branch of our national service.

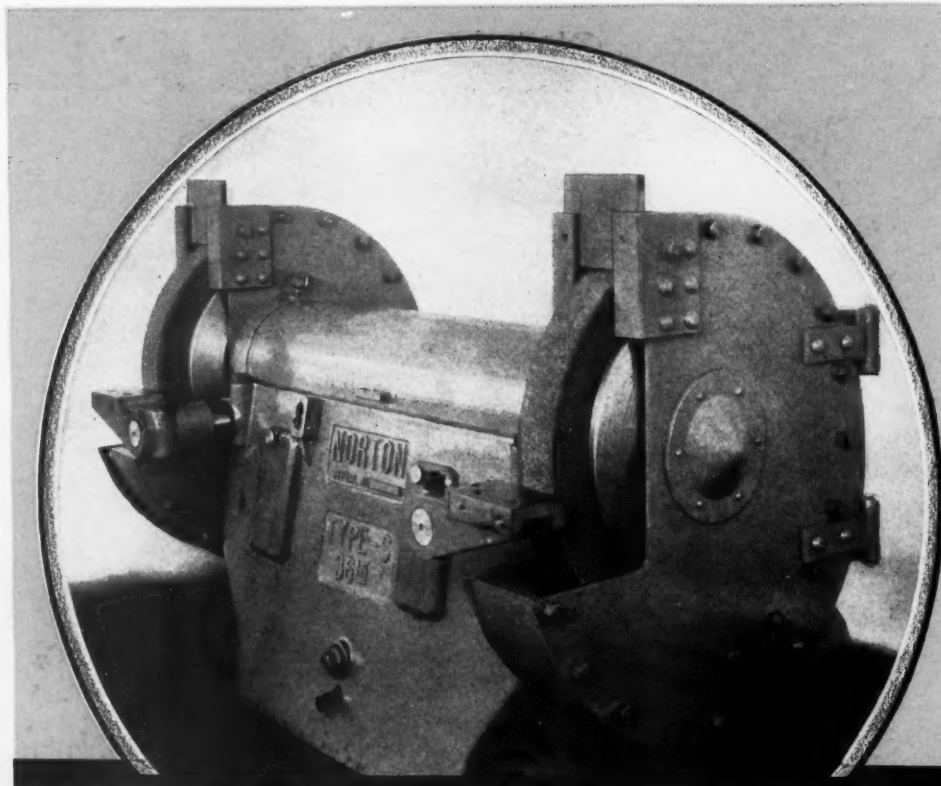
Worcester Serves Marine Engineering



Underwood

Towering lighthouses flashing signals through storm and calm have sent warning and welcome to ships at sea for hundreds of years.

Modern inventions make them more useful than ever, powerful electric lamps give tremendously increased visibility, electric clock work operates the signals automatically. Sentinels of safety, they guard the mariner near our shores!

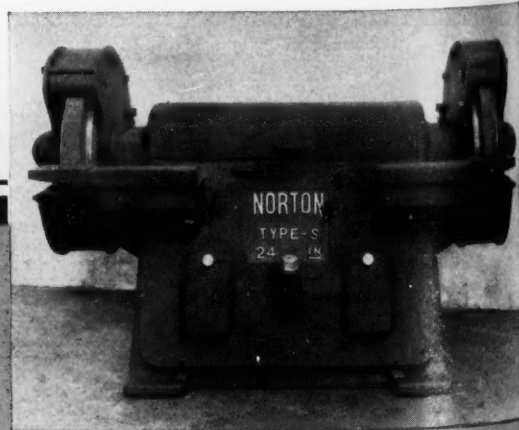


For High Speed

Don't these heavy, sturdy floor stands look as if they could turn out work quickly and economically? They can. They are the Norton Type S motor-in-the-base floor stand of a design especially adapted for high speed, heavy duty—for use with the new Norton Bakelite high speed snagging wheel.

The Norton Floor Stand

NORTON COMPANY, WORCESTER, MASS.
New York Chicago Detroit Philadelphia Pittsburgh Hartford
Norton Company of Canada, Ltd. Hamilton, Ontario



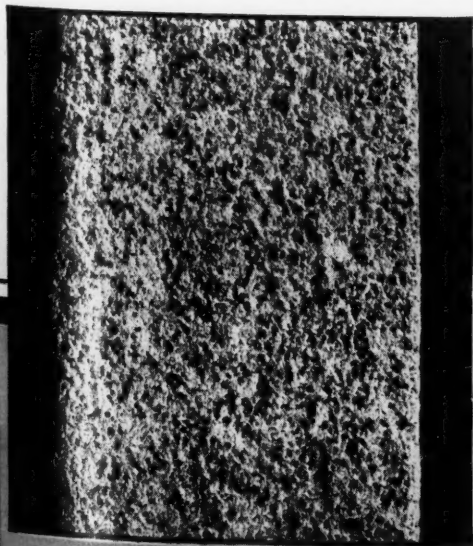
Worcester Serves Marine Engineering



SNAGGING

The Norton Bakelite Wheel

Notice the open structure of this wheel as shown in the close-up photograph below — the thousands of sharp teeth ready to rip off metal. Then remember that it is a high speed wheel, capable of operating with safety at 9000 surface feet per minute. Is it any wonder that it is cutting snagging costs for many plants?



NORTON
GRINDING WHEELS



© Underwood.

Lightships at entrances to rivers and harbors and in the iceberg lanes, and bell and flash buoys planted at particularly dangerous spots still further reduce the hazards of the sea.

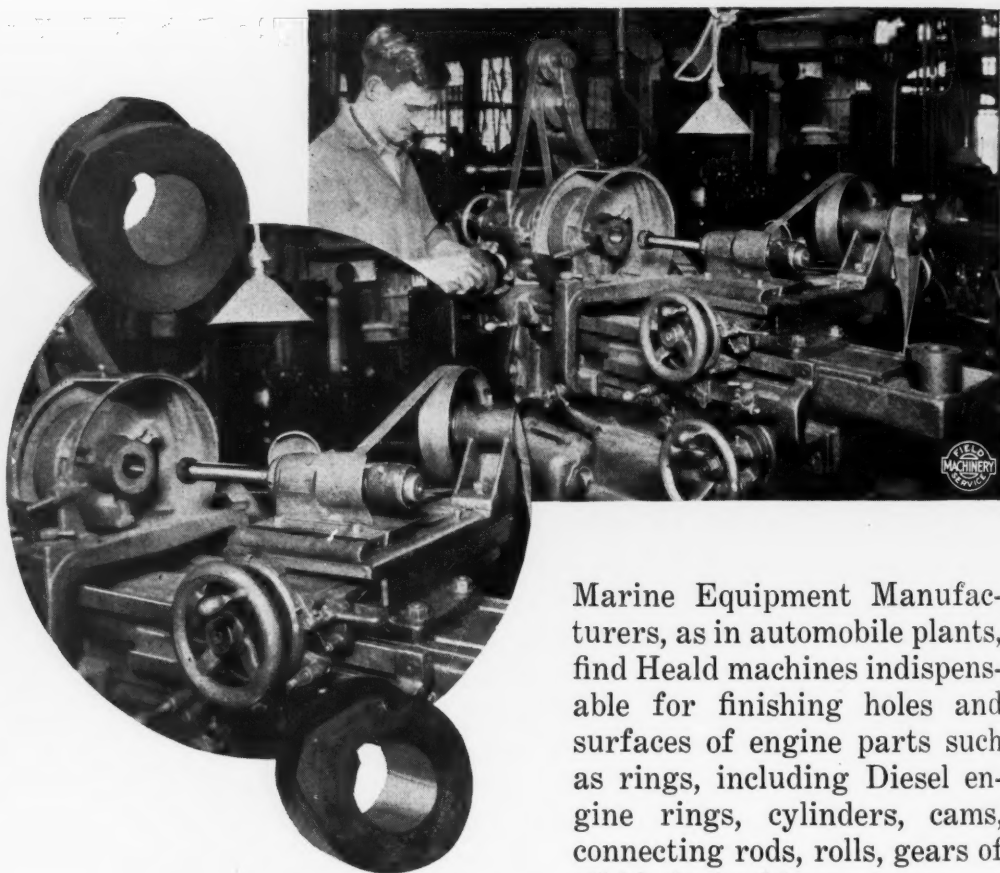
The progress of modern science and mechanics have robbed ocean travel of much of the terror of the unknown.

Worcester Serves Marine Engineering

In Marine Work Means



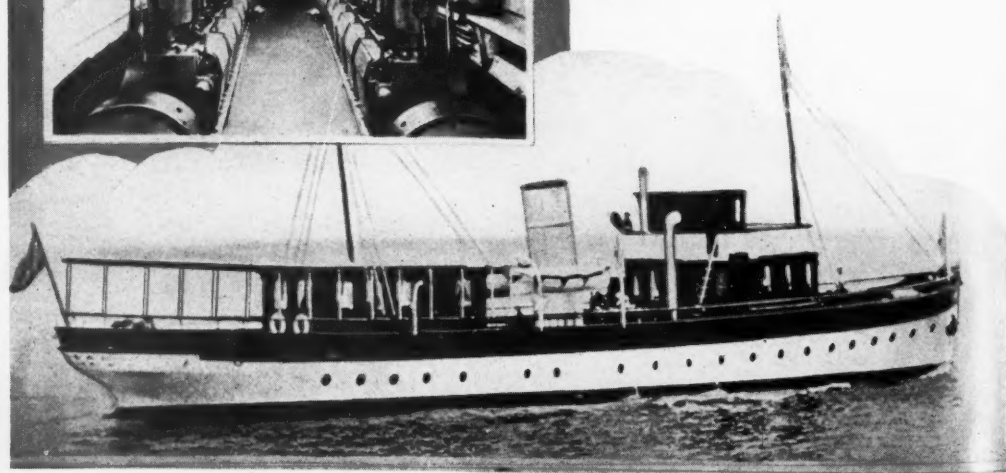
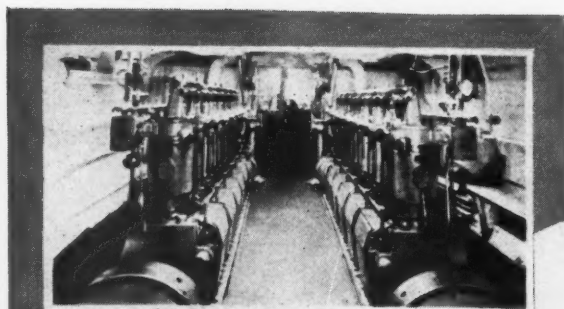
Courtesy of Cunard Line.



Marine Equipment Manufacturers, as in automobile plants, find Heald machines indispensable for finishing holes and surfaces of engine parts such as rings, including Diesel engine rings, cylinders, cams, connecting rods, rolls, gears of all kinds, bushings, etc.

Problems other than hull and turbine designs must be considered by marine engineers. Refrigeration, for example.

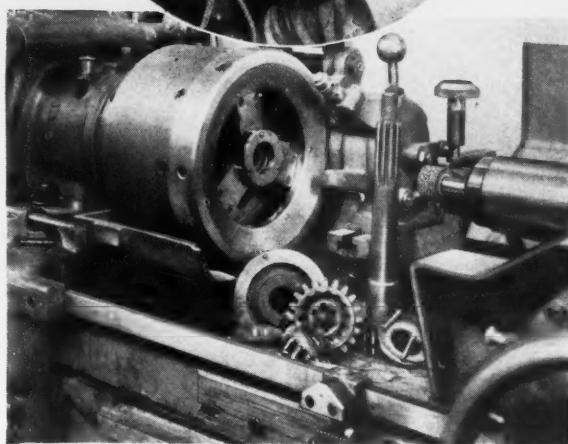
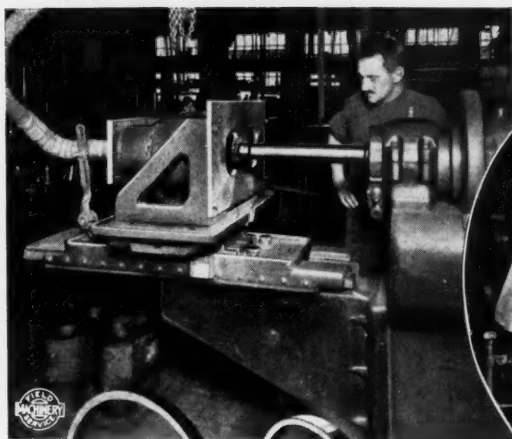
The fare on board a modern liner is comparable with that of the finest hotel grill, requiring refrigerating facilities of bewildering complexity — dependable efficiency.



THE HEALD WORCESTER

Worcester Serves Marine Engineering

the Name HEALD Precision



At the plant of the Standard Motor Construction Company, Jersey City, N. J., Heald's are used exclusively including Internal, Surface and Cylinder Grinders. Marine motors, from 40 to 1000 H.P., made by this concern, are known all over the world and received highest praise during the World War as the power plants used in scores of Navy chasers, patrol boats and auxiliaries.

The ordinary run of marine work is a much heavier and larger type than engine parts for other uses—thus the heavy rugged style No. 25 Surface Grinder handling work up to 30" in diameter, and the style No. 50 Cylinder Grinder grinding holes 14½" in diameter by 23" long are particularly suited to marine work. On work of medium or smaller size, the style No. 72 with its hydraulically driven table handles gears, bushings, and bearings to excellent advantage.



© Underwood.

Like a torpedo shot out of a gun—cutting through water at 50 miles an hour—the modern speed boat is the "precision machine" of boat construction.

Perfectly balanced—with a motor timed like a watch, it typifies what that is best in expert design, skilled labor and specialized equipment.

D MACHINE Co.

MASS., U. S. A.

Worcester Serves Marine Engineering

Vertical Milling Secures Greater Efficiency



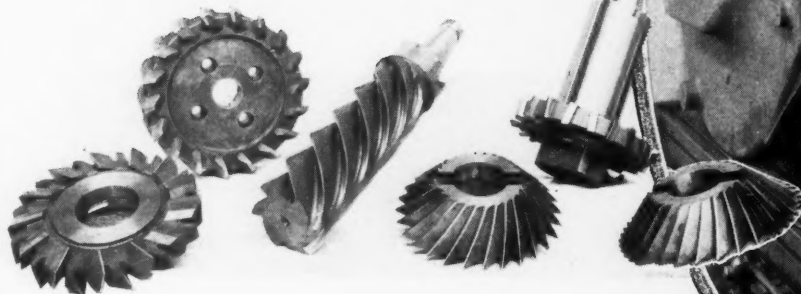
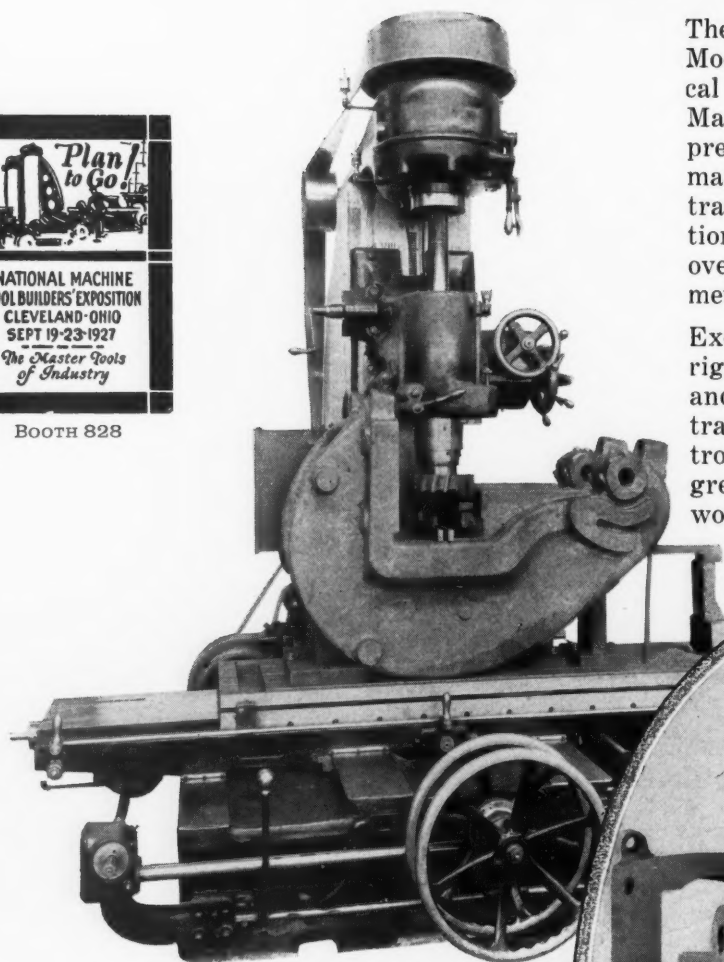
Underwood.

No better type of carrier has been devised for use on the Mississippi than the flat bottomed stern wheelers.

Slow moving, powerful, drawing little water, they carry large cargoes of cotton, sugar cane, corn and other products economically and efficiently up and down the "Father of Waters."



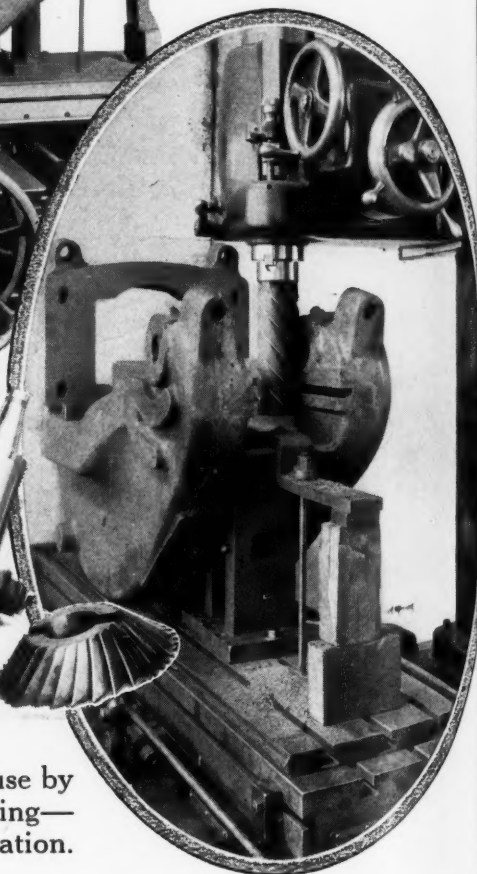
BOOTH 828



Eight (8) of these machines are now in use by leading automotive plants for die sinking—ample evidence of their economical operation.

The application of the New Model No. 6 BECKER Vertical Milling and Die Sinking Machine in the machining of press frames for a prominent manufacturer and as illustrated here secured a reduction of 1/3 in production cost over the previous planing method employed.

Exceptional capacity and rigidity, wide range of feeds and speeds with power rapid traverse and centralized control, are features which insure greatest efficiency possible on work of this kind.



Branch Offices:
3-245 General Motors Bldg.
Detroit, Mich.

REED-PRENTICE CORP.
WORCESTER MASS., U.S.A.

Representatives throughout the World

537 Singer Bldg.
New York City

Worcester Serves Marine Engineering

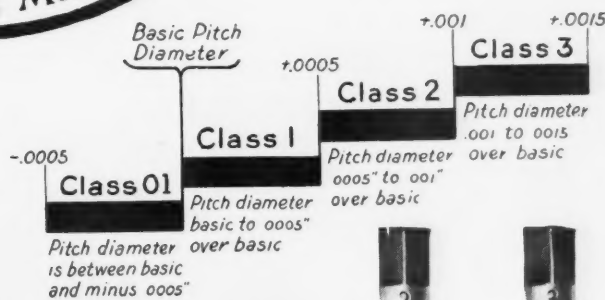
The Outstanding Development

THREADS
"GROUND
from the
solid"

in 100 Years of
Threading
Practice



**.0005"
Tolerance
Taps**



Bath standard hand taps are made in four sizes as shown above, and the tolerance numbers are stamped on the shank. With this simple system, any problem of thread fits can be ideally met.

SINCE early in the 18th century, little advancement has been made in the method of making taps. True, new steels and little niceties of finish have stepped up existing practice from time to time.

The first radical improvement came when John Bath began to grind taps from the solid, hardened blank on a commercial basis, about seven years ago. Industry was quick to sense the advantages of the Bath Process. Now practically every manufacturer who makes parts on a mass-production basis is using Bath Ground Taps. They make possible interchangeability.

Bath Taps are the result of original research and development. Savings of 25% to 40% in tapping expense per unit manufactured are very common.

The same process is being applied to Acme thread taps and special taps of every conceivable kind.

JOHN BATH & CO., Inc., Worcester, Mass.



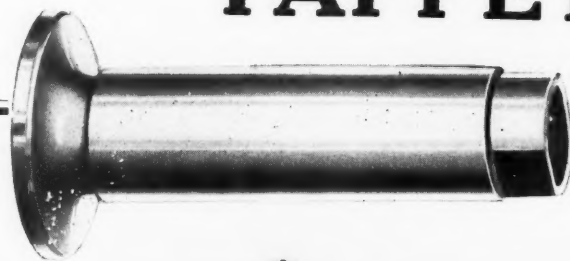
Underwood.

Specialization — the watchword of modern industry—makes modern freighters take on strange shapes to handle special cargoes with maximum efficiency.

—Here the grain ships that carry wheat and other grains from the prairies, through the Great Lakes, the Canals, the St. Lawrence to the sea.

Worcester Serves Marine Engineering

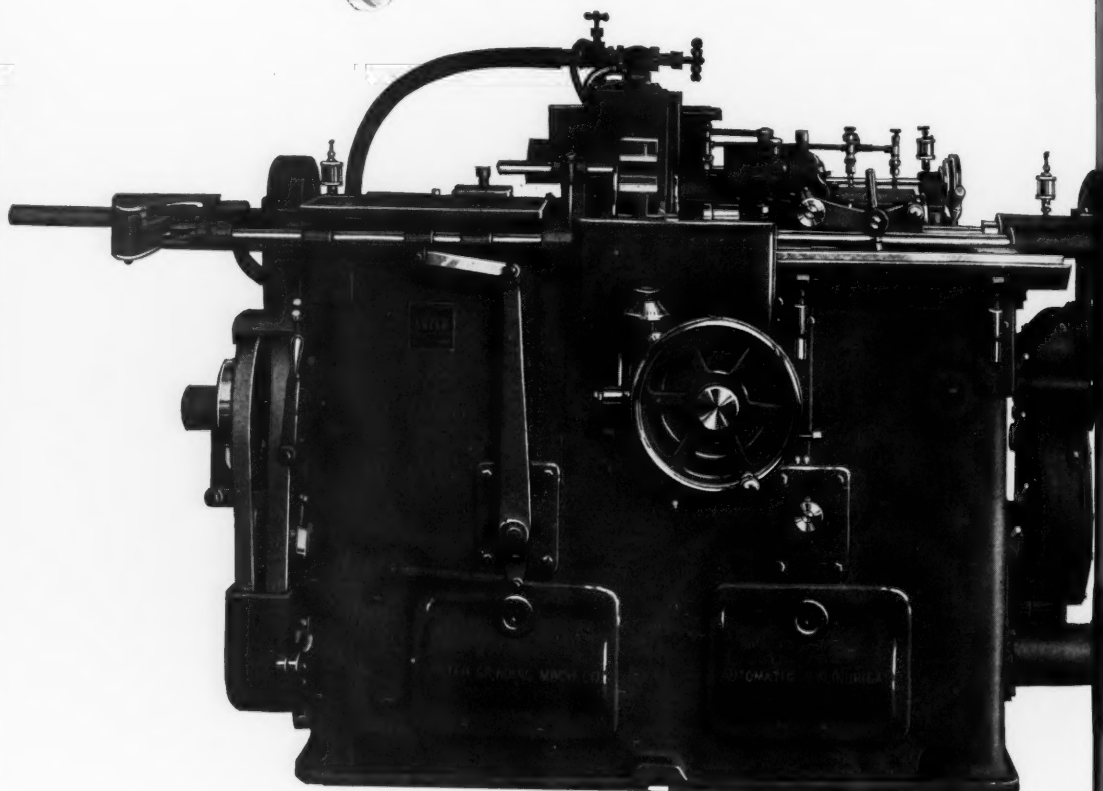
ARTERS for TAPPETS



© Underwood.

Laid up for the winter at Oakland, California, the Alaska Packer's Fleet is a reminder of the day when "wooden ships and iron men" was the rule of the sea.

Steel, steam and power have reduced the hazards, but the iron men still sail the northern ocean in these seaworthy old schooners.



Automatic Cylindrical Grinder

Material—Rough Cast Iron.
Length—2-15/16".
Diameter—21/32".
Reduction—.025".
Limits—.001".

Production—One man operates two machines and finishes 500 pieces per hour.

At the Nash Motors plant in Racine, Arter Automatics are in use on the piston, valve stem guide and tappet jobs. On each job one man operates two machines.

These savings in labor costs can be duplicated in your plant. Send samples or prints for guaranteed production figures.

ARTER GRINDING MACHINE CO.

15 Sagamore Road, WORCESTER, MASS.

Worcester Serves Marine Engineering



Where every day is ironing day

The smooth, flat surface that you see on a Graton & Knight belt is not for beauty's sake alone. It is one of the most important factors in belting efficiency.

Pictured here is a "setting out" machine. It has about the same purpose as a laundry mangle or the ironing machines that are in so many homes now. Graton & Knight belting hides are brought to these machines slightly moist and with the surfaces wrinkled by repeated washings.

Now they must be smoothed out to remove every surface irregularity. First they go through the big setting out machines which

smooth them like an ironer. Then they are laid out in piles for a time. When they have tempered according to the exact Graton & Knight formula, skilled workers finish the process by hand.

The purpose of all this is to give the belting a surface texture or grain that will take hold of the pulleys and hang onto them. In this step you find the characteristic care with which every process in the manufacture of Graton & Knight belting is controlled, to give you a belt that will do more work and stand the wear and tear of continual use. That's why Graton & Knight belts last longer.

GRATON & KNIGHT COMPANY

WORCESTER, MASSACHUSETTS

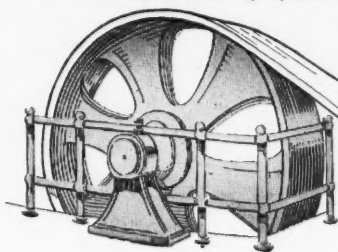
Branch Offices throughout the World.

GRATON & KNIGHT

Standardized

LEATHER BELTING LASTS LONGER

The "STANDARDIZED BELTING MANUAL" contains 170 pages of useful information about belting, how to use it, take care of it, and make it deliver the most for your money. Send for a copy.



101-Y
Graton & Knight Co., Worcester, Mass.
Send me a copy of "Standardized Belting Manual."

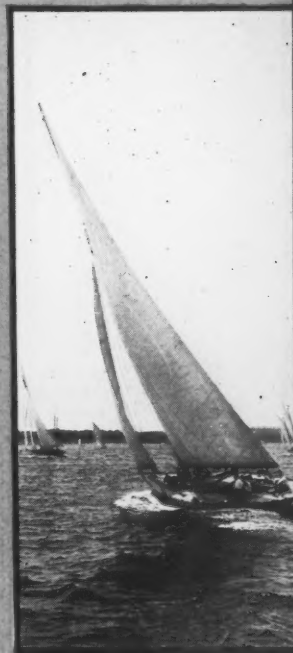
Name

Company

Place

Prices, quality for quality, 5 to 10% lower than the field.

GRATON
KNIGHT



© Underwood

Not all the progress in boat design is confined to steam and power ships.

Sailing yachts are speedier, more trim and beautiful each year.

All the ship builders art and the best of mechanical equipment are required to produce these white-winged racers that fly before the wind.

Worcester Serves Marine Engineering

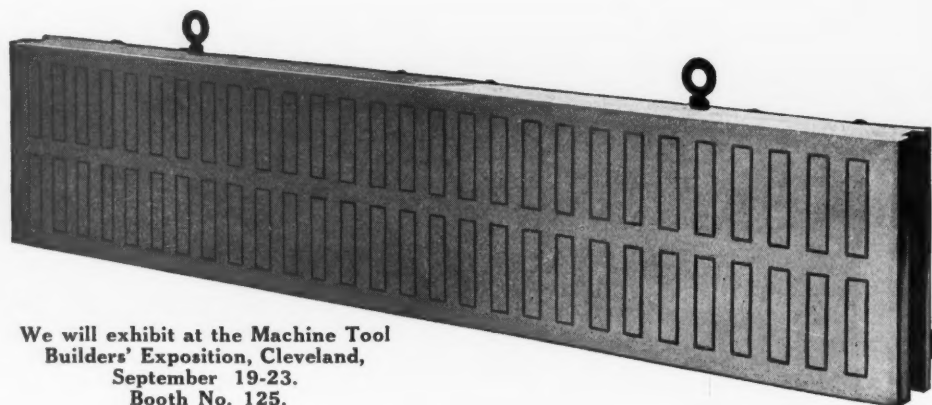


"Walker"—The Chuck for all Classes of Marine Work

To build stout ships requires materials of quality—to work these materials, tools of special excellence are necessary. Strong, accurate machines and appliances to handle with accuracy and speed the great variety of work used in ship building. The versatility of Walker Magnetic Chucks, the variety of profitable applications possible to each model, makes them the accepted holding method for all classes of marine work.

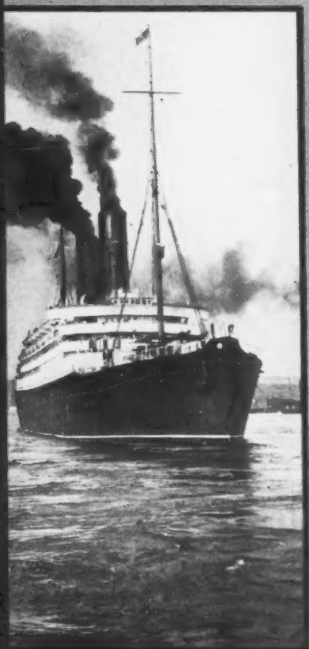
Shown above is a Walker No. 1887 (18" x 87") All Steel Rectangular Magnetic Chuck on a Pratt & Whitney 22" Surface Grinder. Below is the same chuck, equipped with supporting angles for use in a vertical position on Face Grinders. This equipment is typical of the powerful, heavy-duty Walker Chucks that hold big work rigid on the grinder or planer.

"Walker Magnetic Chucks are the best way to hold most work, the only way to hold some of it."



We will exhibit at the Machine Tool
Builders' Exposition, Cleveland,
September 19-23.
Booth No. 125.

O. S. WALKER CO., Inc., Worcester, Mass.

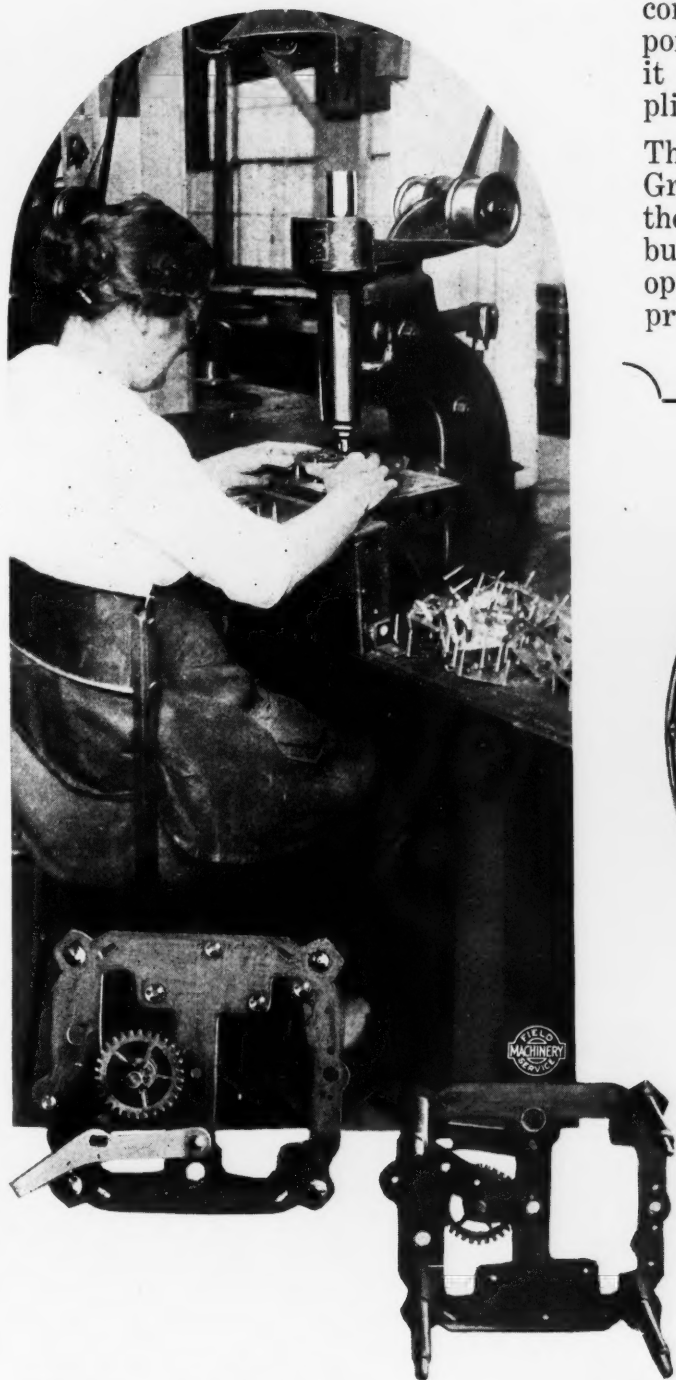


Courtesy of Cunard Line

Every craft that floats, from ferry boat to ocean greyhound, from racing motor boat to sturdy tug, owes its efficiency to the men who built it and the mechanical equipment at their command.

Worcester — serving every industry—furnishes metals and machines that aid in enabling American built ships to hold their own with the finest afloat.

GRANT Riveting



Efficient—Profitable Assembling!

Thanks to modern manufacturing methods an efficient alarm clock is a very inexpensive instrument. The clock of today is as fine as a watch, compared to the old-fashioned clumsily made timepieces produced when completely handmade. Riveting is an important operation in clock manufacture and it must be accurately and strongly accomplished.

The Parker Clock Co., Meriden, Conn., find Grant Riveting Machines exactly suited to their work and keep two of them constantly busy. What formerly was laborious hand operation is now a thoroughly dependable production job.



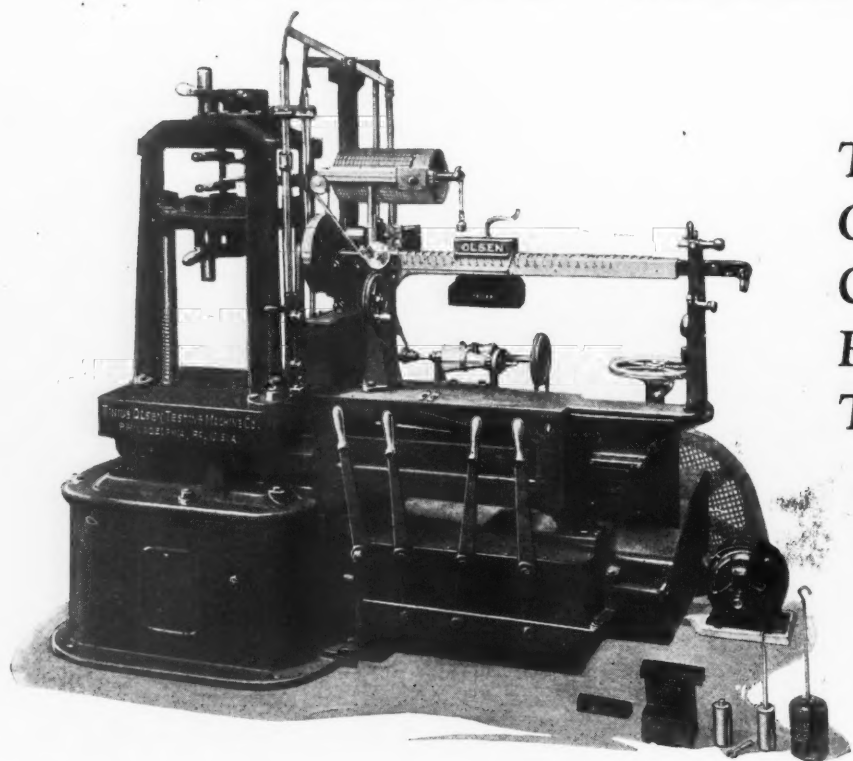
The smaller sizes of Grant Noiseless Rivet Spinning Machines are sensitively, accurately riveting many classes of work that previously seemed too difficult and delicate for machine production. Other Grant models set big rivets designed for heavy strains. In every case Grant Riveting is an efficient and profitable assembling method. Let us tell you something about Grant Noiseless Rivet Spinners and Grant Rotary Vibrating Riveters.

THE GRANT MFG. & MACHINE COMPANY

N. W. Station, Bridgeport, Conn.

OLSEN

TESTING MACHINES



*Their Rapid
Operation and
Convenience
Reduce
Testing Costs*

Frequent tests of raw materials, parts in progress and finished product are imperative if modern materials and machines are to measure up to the heavy demands placed on them.

With the Olsen Latest Automatic and Autographic Universal Testing Machine tension, transverse and compression tests can be made very rapidly and with great accuracy. The machine is built to be operated along familiar shop lines. It is driven by an enclosed direct connected motor with a quick change gear box having eight forward and re-

verse speeds. Speeds of 4" to 8" per minute provide for rapid adjustments — testing speeds are from 0.05" to 2".

Results are recorded autographically (magnified ten times) on a 10" x 20" cross section chart. Records may be obtained for any point in the travel of the cross head right up to rupture point of the specimen.

Economies of space, time and power and its accuracy adapt this Latest Olsen Testing Machine to the needs of both shop and laboratory—other Olsen Testing Machines cover the widest range and most specialized of needs.

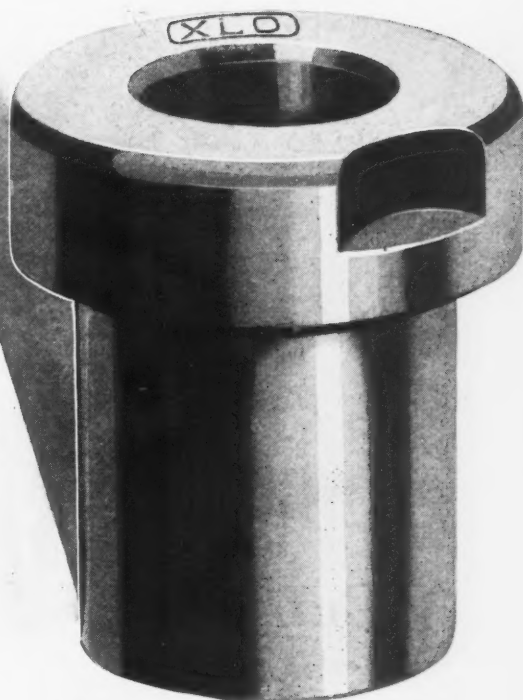
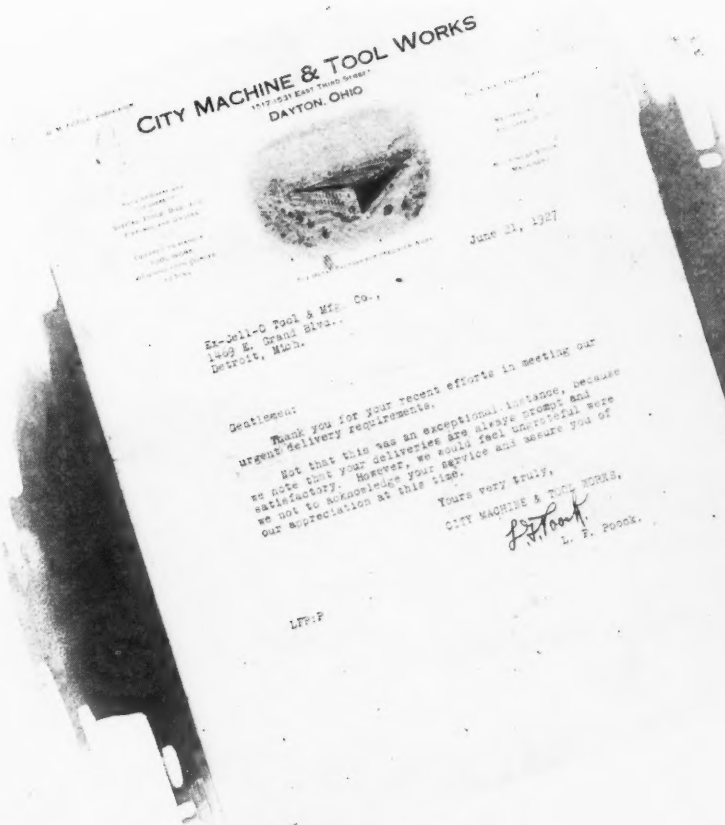


Other Olsen Products—Olsen Static-Dynamic Balancing Machines. Olsen Fly-Wheel Balancing Machines, Olsen Production Type Motor Driven Brinell Hardness Testers, and Testing Machines for All Industrial Materials.

Catalog sent on request.

TINIUS OLSEN TESTING MACHINE COMPANY

500 North Twelfth Street, Philadelphia, Pa.



Visit the Ex-Cell-O Tool & Mfg. Co. exhibit at the National Steel and Machine Tool Exposition, Detroit—also National Machine Tool Builders Exposition, Cleveland, September 19th to 23rd.

You, too, Will Get “Same Day” Delivery from X-L-O

A constant source of supply, and immediate delivery; these two things are absolutely necessary to successful bushing standardization. So X-L-O uses a bushing unpatented design; a bushing which could be manufactured in your own plant if occasion arose. And, still more important, X-L-O maintains a tremendous stock of all standard styles and sizes—2534 of them, which always insures shipment the same day your order is received—often within the same hour!

EX-CELL-O TOOL & MFG. CO.
1473 East Grand Boulevard
DETROIT

Send for the free illustrated booklet, “Lowering the Cost Per Hole.” It tells the whole story of drill jig bushing standardization. Just mail the coupon.



Ex-Cell-O Tool & Manufacturing Co.,
1473 East Grand Boulevard, Detroit, Mich.

Please send me a copy of “Lowering the Cost Per Hole.”

Name

Position

Firm

City

X-L-O Drill Jig Bushings



INDEX



NOT QUITE
AS FAST AS
THE SPIRIT
OF ST. LOUIS



But—

THE LEADING HIGH SPEED MACHINE IN ITS CLASS

is the

NEW INDEX "O" $\frac{7}{16}$ IN. AUTOMATIC SCREW MACHINE

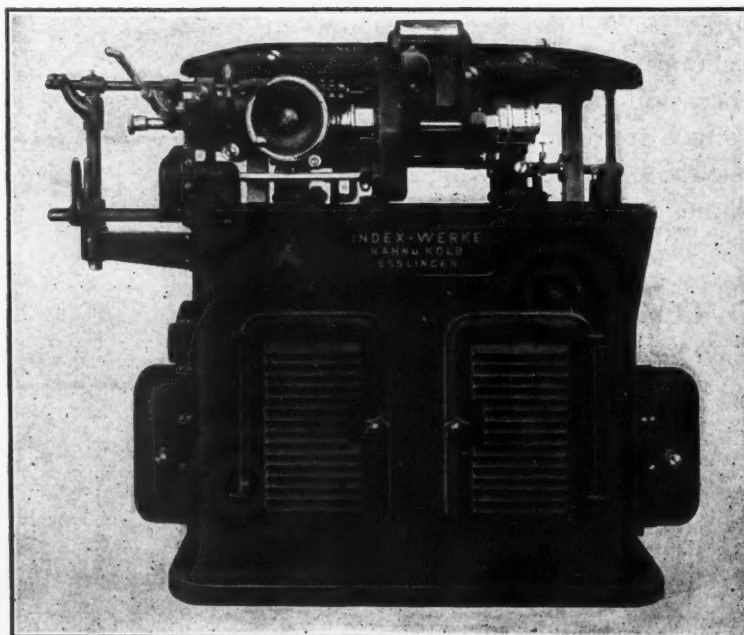
with

HIGH SPEED THREADING OR TAPPING—HIGH SPEED DRILLING—
BOX TOOL—AND LONGITUDINAL TURNING ATTACHMENT

*Come and see it in operation or send us samples
for production estimates.*



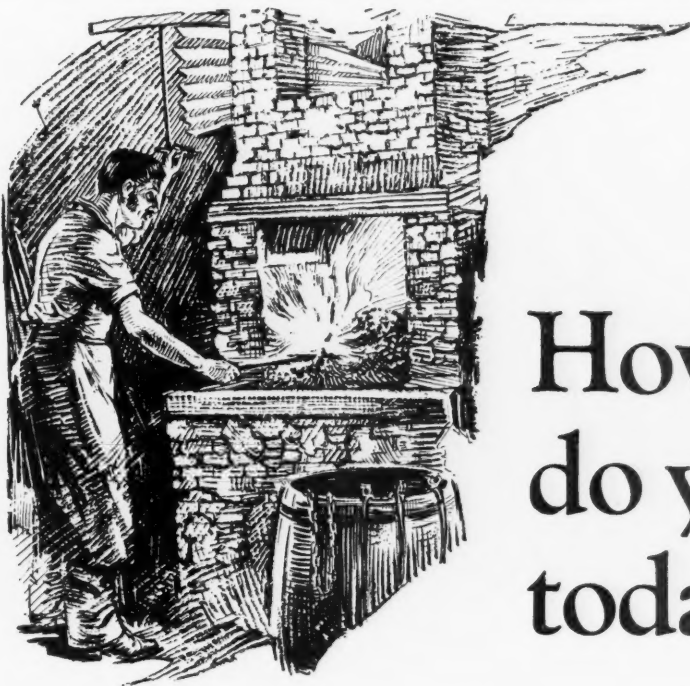
80
per
MIN.



64
per
MIN.

Index "O" $\frac{7}{16}$ in. High Production Automatic Screw Machine for Motor Drive
Work Spindle—5000 R. P. M. Threading Spindle—6000 R. P. M.

INDEX MACHINERY CORPORATION, 109 WEST 64TH STREET, NEW YORK CITY



How many do you find today?

TIME was when you could walk into almost any machine shop and see metal being annealed, hardened and tempered by means of the old-fashioned hand bellows and forge. But that was long ago—in the days when production and output were limited. Now, the uncompromising requirements of mass production necessitate the modern heat-treating furnace that is so widely used.

In cleaning, similarly, modern changed conditions—faster pro-

duction schedules—no longer can tolerate the old-time, wasteful, labor-consuming practices such as cleaning with caustic, potash, lye and soda. The need now is for efficient, economical OAKITE cleaning. Modern, up-to-date cleaning methods that simplify handling, reduce labor, minimize waste on all cleaning operations.

Write for explanatory booklets; or better, have the local OAKITE service man call. No obligation.

OAKITE IS MANUFACTURED ONLY BY

OAKITE PRODUCTS, INC., 26 Thames Street, NEW YORK, N. Y., (Formerly OAKLEY CHEMICAL CO.)

Oakite Service Men, cleaning specialists are located at

Albany, Allentown, Pa., Altoona, Pa., *Atlanta, Ga., Baltimore, *Birmingham, *Boston, Bridgeport, *Brooklyn, Buffalo, Camden, Charlotte, N. C., Chattanooga, Tenn., *Chicago, *Cincinnati, *Cleveland, *Columbus, O., *Dallas, *Davenport, *Dayton, Decatur, Ill., *Denver, *Des Moines, *Detroit, Erie, Flint, Mich., Fresno, Cal., *Grand Rapids, Harrisburg, Hartford, Houston, Texas, *Indianapolis, Jacksonville, Fla., *Kansas City, *Los Angeles, Louisville, Ky., *Memphis, Tenn., *Milwaukee, *Minneapolis, *Montreal, Newark, Newburgh, N. Y., New Haven, *New York, *Oakland, Cal., *Omaha, Neb., *Philadelphia, *Pittsburgh, Portland, Me., *Portland, Ore., Providence, Reading, *Rochester, Rockford, Rock Island, *San Francisco, *Seattle, *St. Louis, South Bend, Ind., Syracuse, *Toledo, *Toronto, Trenton, N. J., *Tulsa, Okla., Utica, *Vancouver, B. C., Williamsport, Pa., Worcester.

*Stocks of Oakite materials are carried in these cities.

OAKITE

TRADE MARK REG. U.S. PAT. OFF.

Industrial Cleaning Materials and Methods



WICACO

CONTINUOUS OIL GROOVER

is unequalled for production and quality in cutting oil grooves—straight, cross, right-hand or left-hand helical on external or internal surfaces.

Marvelous Speed of Production

Send our engineers samples of the bushings you want grooved and let us show you, by actual test, how the Wicaco will increase your production and lower the unit cost.

WICACO

Screw & Machine Works, Inc.

Stenton Ave. and PHILADELPHIA Wayne Junction
Louden Street P. & R. R.

Established in 1868—59 years of continuous production

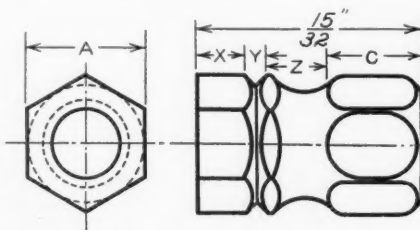
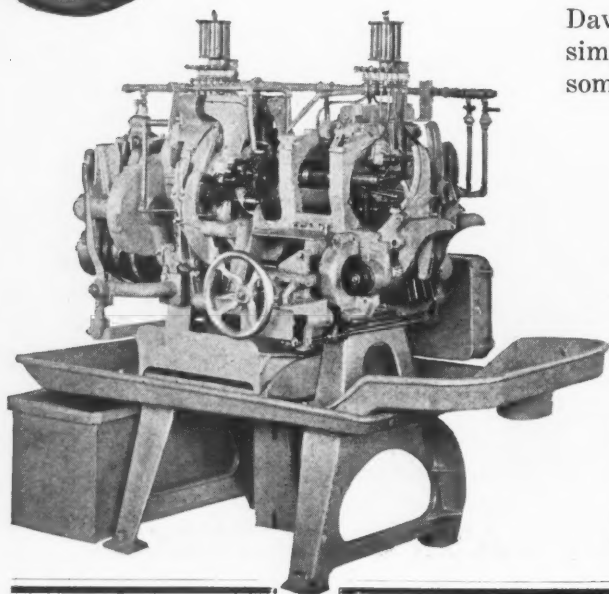
RAYON PUMPS AND EQUIPMENT



“Davenport” Production One Every Second

These banjo nuts are reproduced three times the actual size so that you can realize the work done in the traditional Davenport “One Second.” Material: hex stock; operations: chamfering, forming, tapping; finish: satisfactory.

Davenport “One Second” Automatics make records on both simple and elaborate screw machine work. An estimate on some job that’s troubling you will show you why.



Send blue prints
or drawings;
write for details
of the
Davenport
“One Second”
Automatic.

Davenport Machine Tool Co.

Rochester, N. Y.

Represented by Motch & Merryweather Machy. Co., Cleveland, Cincinnati,
Detroit, Pittsburgh. Henry Prentiss & Co., Inc., New York.

Here's Something New!

A Better Steel Stamp Guaranteed and Date-Marked

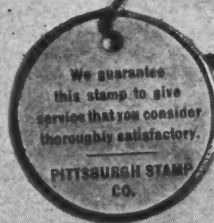
Thor Steel Marking Stamps, "The Stamp with a Blue Head", represent a distinct step forward in the manufacture of these necessary shop accessories. They are plainly stamped with the date of sale, and unconditionally guaranteed to give the service that *you*, the buyer consider satisfactory. These stamps are well designed and made of the highest quality materials with all the care and accuracy their sweeping guarantee implies.

Thor Stamps have many other points of superiority that appeal to the careful buyer, including thumb markings, which simplify ascertaining the character on the stamp; turned head, an insurance of clear marking; uniform length; superior steel and temper; more marks per stamp; uniform characters.

Our new circular "The Stamp with a Blue Head," will interest you. Shall we send it?

THE PITTSBURGH STAMP COMPANY
810 CANAL STREET, PITTSBURGH, PA.

Makers of Thor Marking Tools



Thor

"The Stamp With a Blue Head"



Pays for Itself on the First Job

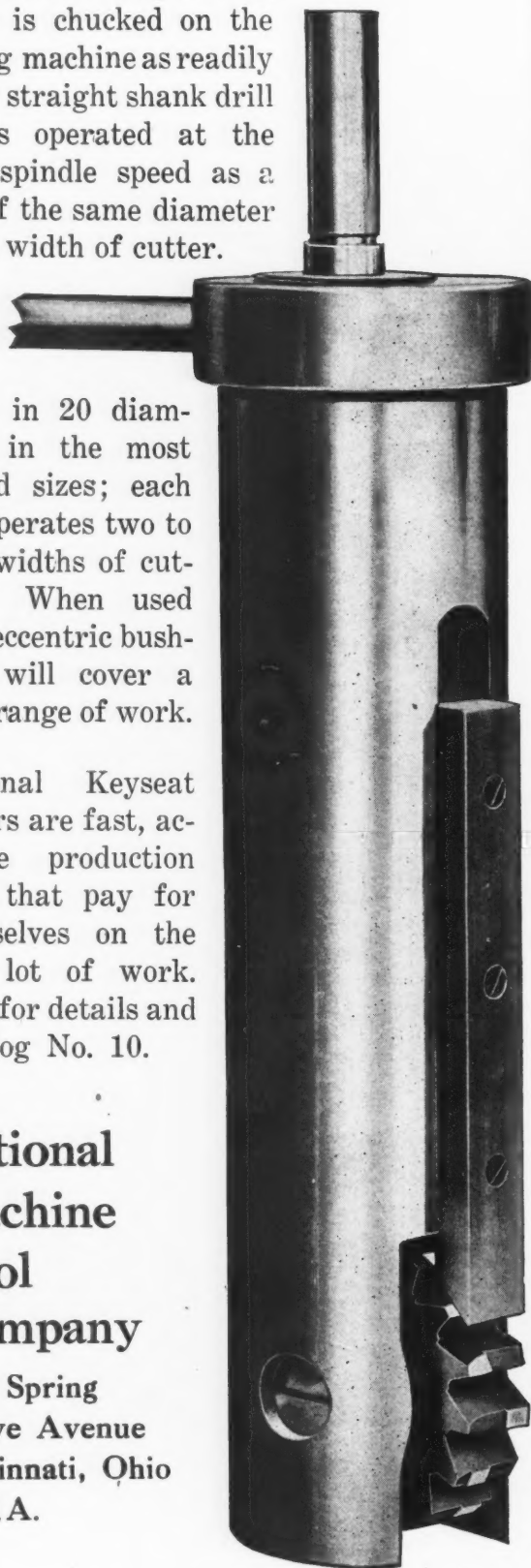
The National Keyseating Miller is chucked on the drilling machine as readily as any straight shank drill and is operated at the same spindle speed as a drill of the same diameter as the width of cutter.

Made in 20 diameters in the most needed sizes; each size operates two to four widths of cutters. When used with eccentric bushings will cover a wide range of work.

National Keyseat Millers are fast, accurate production tools that pay for themselves on the first lot of work. Send for details and Catalog No. 10.

**National
Machine
Tool
Company**

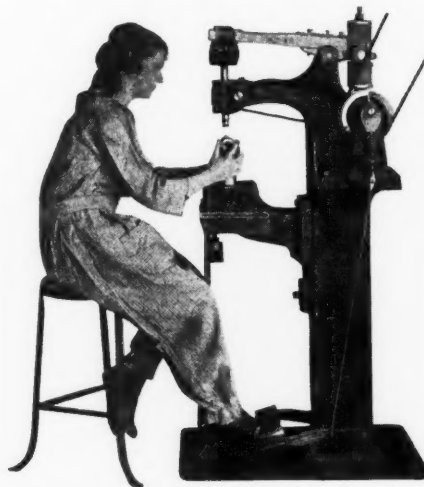
2274 Spring
Grove Avenue
Cincinnati, Ohio
U.S.A.



THE HIGH SPEED RIVETING HAMMER

(Patented)

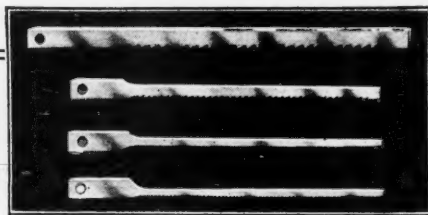
COLD RIVETING by HIGH SPEED HAMMER Method
means improved quality and increased production.



Nine sizes to handle rivets from 1/64 to 1 1/2 in. in diameter

Send samples to be riveted for your approval

THE HIGH SPEED HAMMER CO., Inc.
305-321 Norton St.
ROCHESTER, N. Y., U.S.A.



Davis Keyseat Cutters

Ready to ship in sizes from 1/16" to 1" diameter, in 16ths and some 32nds. Users of Davis Keyseaters find our tool service a valuable feature of Davis efficiency.

Quality Cutters in High Speed or Carbon Steels *when you need them*, keeps your keyseater producing profitably on quantity or short run work all the time.

Send for machine details and a price list of Davis Keyseat Cutters and Davis Broaches for all types of machines.

Davis Keyseater Co.
255 Mill St., Rochester, N. Y.

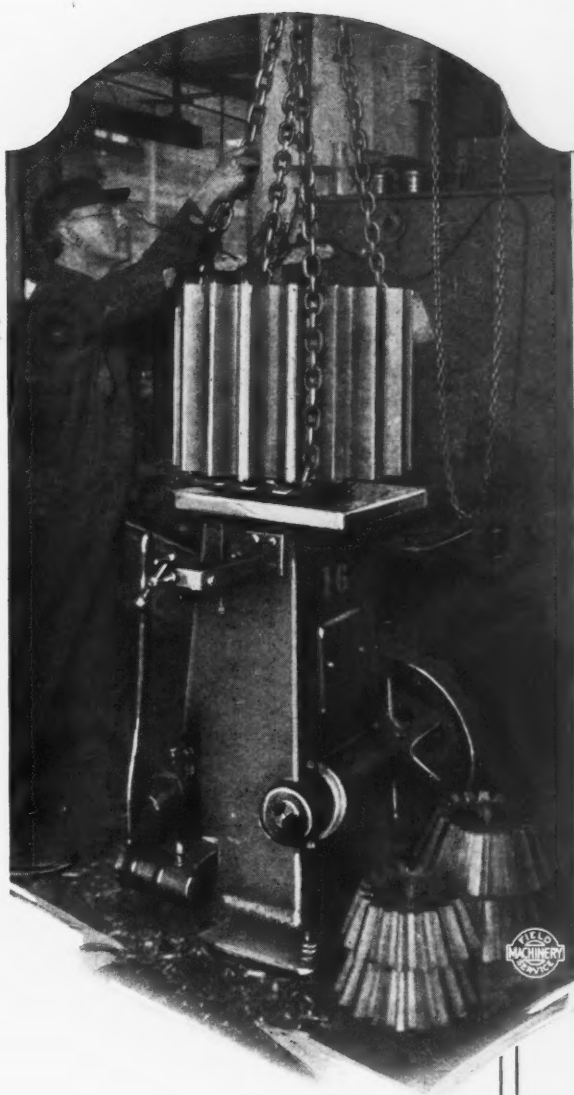
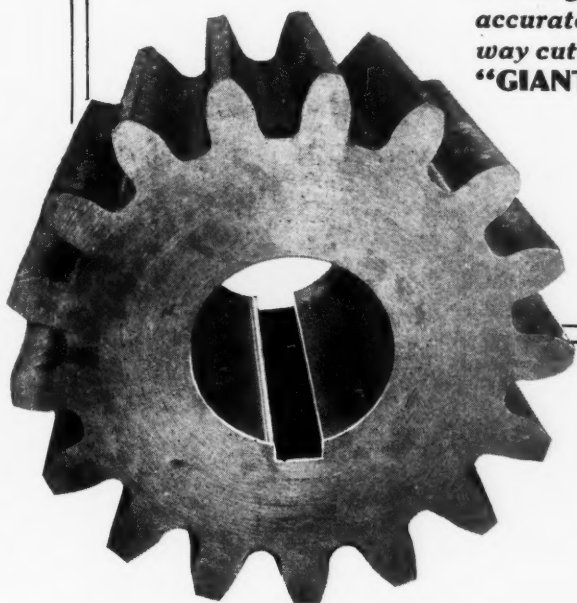
"GIANT" KEYSEATER

15 Years of Accurate, Dependable Service

This "**GIANT**" has just completed a keyseating operation on the forged steel pinion about to be hoisted away. This pinion weighed 1050 pounds, measured 21¼" outside diameter, 16" face. The keyway, which measured 1¾" wide, ½" deep and 16" long, was cut in 1¾ hours, floor to floor.

This is one example of the work the "**GIANT**" has been turning out for over 15 years in the plant of the Earle Gear & Machine Co., Philadelphia, Pa. Gears of all dimensions from tiny fishing-reel size to big 18' diameter models are produced by this busy organization in many metals—cast-iron, cast-steel, machine steel, bronze and brass.

*The pinion,
showing clean,
accurate key-
way cut by the
"GIANT"*



The "**GIANT**" handles the keyseating of all with consistent speed, accuracy and economy.

*Let us tell you more
about this profitable
machine.*

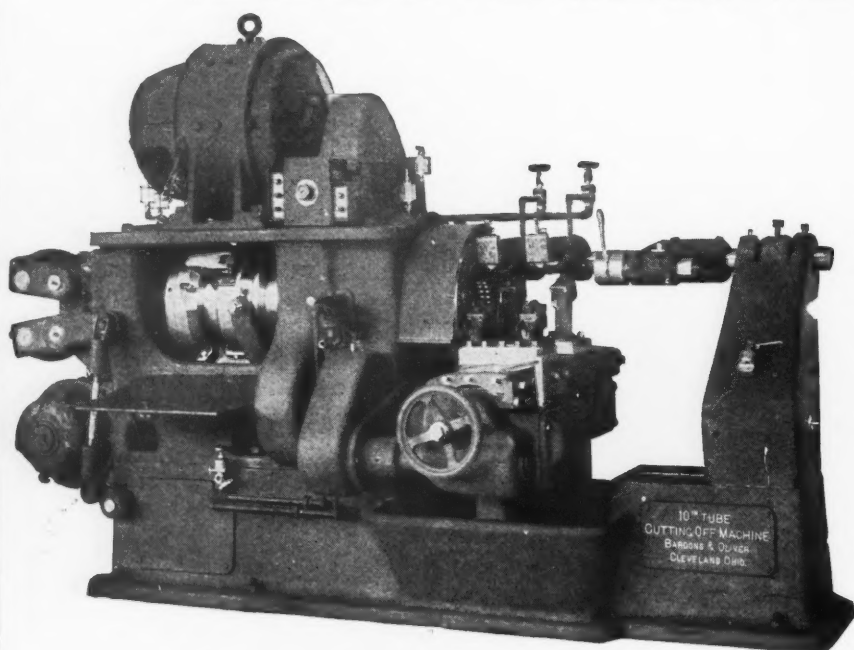
MITTS & MERRILL

843 Water Street Saginaw, Mich

FOREIGN AGENTS: Burton, Griffiths & Co., London, England.
Aux Forges de Vulcain, Lyons and Paris, France. V. Lowener,
Oslo, Norway and Stockholm, Sweden.

Bardons & Oliver Tube Cutting-off Machine

Production on Thin and Thick Wall Steel Tubing



Two cutting-off tool slides, sufficiently wide to carry one, two or more tool holders, both front and rear, permit cutting several pieces (depending on length) at the same time.

Collet form of chuck, air operated with control conveniently located.

Roller feed controlled by the same motion that operates the collet.

Quick return to the tool slides.

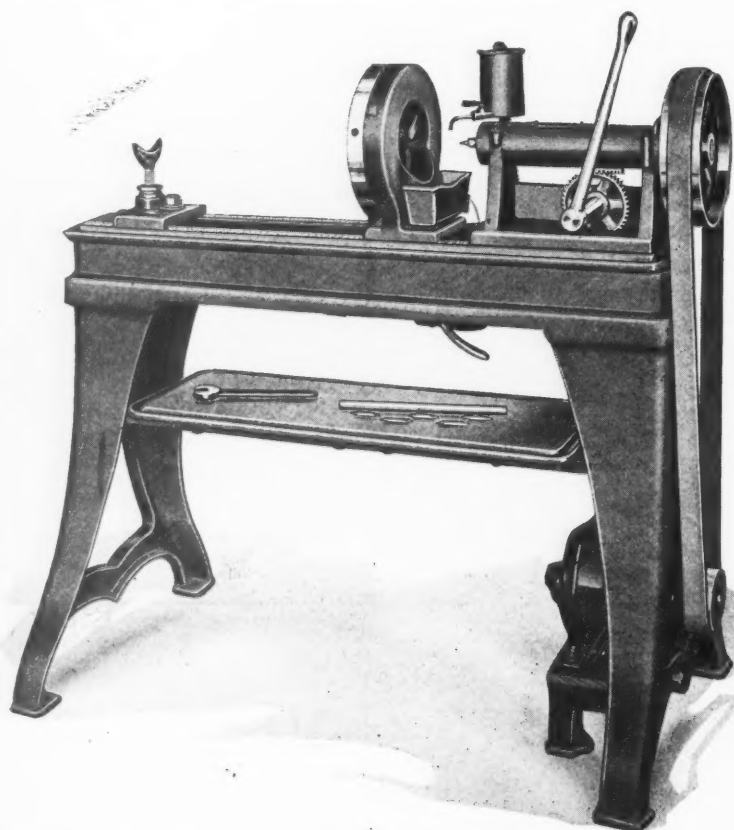
Special chamfering attachments, and other features add to the value of this machine.

Let us send you details.

Sizes up to 14" diameter.

These Cutting-Off Machines have met the most severe mill tests. They insure accuracy and production on large or small, light or heavy work.

BARDONS & OLIVER of CLEVELAND, OHIO



Centering Machines

Total of twenty-nine sizes and styles of standard machines for centering work ranging in diameter from $\frac{1}{4}$ "-9". One or two spindle machines in single or opposed head types. Also turntable and work revolving centering machines.

THE D. E. WHITON MACHINE CO., New London, Conn.



Belt "RIDE"?

~ or ~



Belt DRIVE!

Rigging up a belt between two pulleys does not give you a belt **DRIVE**. Unless *both* pulleys really **PULL**, you have belt "Ride"—a wasteful condition.

Often the driving pulley puts power *into* a belt but the receiving pulley is unable to take the power *out*. The belt slips and slides along the face of the second pulley and only a small portion of the power gets to the driven machine.

Eliminate belt "Ride." Use **Rockwood PULLEYS** and make a real belt **DRIVE**. These superior **PULLEYS**, with their end-grain fibres having a natural ability for **PULLING** a belt, give a surprising increase in power... smooth, steady and dependable.

There isn't a belt-driven machine built that cannot be benefited in some way by the use of **Rockwood PULLEYS**. Put them to the test!

[We are always ready to assist manufacturers—
and users—of belt-driven machinery to get maxi-
mum results with properly designed belt drives.]

THE ROCKWOOD MANUFACTURING CO.
INDIANAPOLIS, INDIANA, U. S. A.

ROCKWOOD

PULLEYS THAT PULL



Complete Service Stocks from Coast to Coast!

For prompt deliveries we maintain a national distribution of stocks as listed below. Daily factory shipments keep these stocks complete.

- *ALBANY, N. Y.—909 Sizes 1½ to 8 in. dia.
Sager-Spuck Supply Co., 364 Broadway.
- ATLANTA, GA.—1734 Sizes 1½ to 12 in. dia.
Fulton Supply Co., 70 Nelson St.
- *BALTIMORE, MD.—1297 Sizes 1½ to 10 in. dia.
Carey Machinery & Sup. Co., 119 E. Lombard St.
- BIRMINGHAM, ALA.—909 Sizes 1½ to 8 in. dia.
Matthews Electric Supply Co.
- BOSTON, MASS.—2194 Sizes 1½ to 14 in. dia.
Olmsted-Flint Corp., Cambridge.
- *BUFFALO, N. Y.—1297 Sizes 1½ to 10 in. dia.
Root, Neal & Co., 178 Main St.
- *CHARLOTTE, N. C.—909 Sizes 1½ to 8 in. dia.
The Charlotte Supply Co., 500 Mint St.
- *CHATTANOOGA, TENN.—909 Sizes 1½ to 8 in. dia.
The James Supply Co., 1104 Market St.
- CHICAGO, ILL.—2194 Sizes 1½ to 14 in. dia.
Chicago Electric Co., 740 W. Van Buren St.
- CINCINNATI, OHIO—1297 Sizes 1½ to 10 in. dia.
Doermann-Rocher Co., 450 E. Pearl St.
- CLEVELAND, OHIO—2194 Sizes 1½ to 14 in. dia.
Strong, Carlisle & Hammond, 1394 W. Third St.
- DALLAS, TEXAS—2194 Sizes 1½ to 14 in. dia.
Southwest General Elec. Co., 1801 N. Lamar St.
- *DAYTON, OHIO—909 Sizes 1½ to 8 in. dia.
Patterson Tool & Sup. Co., 125 E. Third St.
- *DENVER, COLO.—909 Sizes 1½ to 8 in. dia.
Hendrie & Bolthoff Mfg. & Sup. Co., 1635 17th St.
- *DES MOINES, IOWA—909 Sizes 1½ to 8 in. dia.
Iowa Machy. & Sup. Co., 315 W. Court Ave.
- DETROIT, MICH.—2194 Sizes 1½ to 14 in. dia.
Spaulding Electric Co., 1344 Michigan Ave.
- *GRAND RAPIDS, MICH.—909 Sizes 1½ to 8 in. dia.
F. Ranville Co., 241 Pearl St., N. W.
- INDIANAPOLIS—2194 Sizes 1½ to 14 in. dia.
Rockwood Paper Pulley Stores, Inc., 1801 Englebb.
- *JACKSONVILLE, FLA.—909 Sizes 1½ to 8 in. dia.
Cameron & Barkley Co., 605 E. Forsyth St.
- *KANSAS CITY, MO.—1297 Sizes 1½ to 10 in. dia.
Webb Belting Co., 1501 West Twelfth St.
- LOS ANGELES—2268 Sizes 1½ to 24 in. dia.
Illinois Electric Co., 313 S. San Pedro St.
- LOUISVILLE, KY.—909 Sizes 1½ to 8 in. dia.
E. D. Morton & Co., Inc., 516 West Main St.
- *MEMPHIS, TENN.—909 Sizes 1½ to 8 in. dia.
The Riechman-Crosby Co., 223 S. Front St.
- MILWAUKEE, WIS.—1297 Sizes 1½ to 10 in. dia.
Julius Andrae & Sons Co., Broadway and Mich.
- *NASHVILLE, TENN.—909 Sizes 1½ to 8 in. dia.
Nashville Machine & Sup. Co., 123 3rd Ave. N.
- *NEW ORLEANS—909 Sizes 1½ to 8 in. dia.
Woodward, Wight & Company.
- NEW YORK CITY—2194 Sizes 1½ to 14 in. dia.
Rockwood Paper Pulley Stores, Inc., 6 Murray St.
- OMAHA, NEB.—909 Sizes 1½ to 8 in. dia.
Interstate Machy. & Sup. Co., 1006 Douglas St.
- *OKLAHOMA CITY—909 Sizes 1½ to 8 in. dia.
A. W. White, 424 West Reno St.
- PHILADELPHIA, PA.—21 94 Sizes 1½ to 14 in. dia.
Charles Bond Company, 617 Arch St.
- *PITTSBURGH, PA.—1734 Sizes 1½ to 12 in. dia.
Transmission & Belting Co., 325 Second Ave.
- ROCHESTER, N. Y.—909 Sizes 1½ to 8 in. dia.
Rochester Electrical Sup. Co., 240 St. Paul St.
- SALT LAKE CITY—909 Sizes 1½ to 8 in. dia.
Capital Electric Co., 310 W. Second South St.
- SAN FRANCISCO—2248 Sizes 1½ to 20 in. dia.
Buzzell Electric Works, 130 8th St.
- SEATTLE, WASH.—2194 Sizes 1½ to 14 in. dia.
Seattle Hardware Co., 501 First Ave. South.
- ST. LOUIS, MO.—2194 Sizes 1½ to 14 in. dia.
Teuscher Pulley & Belting Co., 801 N. 2nd St.
- ST. PAUL, MINN.—1297 Sizes 1½ to 10 in. dia.
St. Paul Electric Co., 145 E. Fifth St.
- SYRACUSE, N. Y.—909 Sizes 1½ to 8 in. dia.
Syracuse Supply Co., 314 W. Fayette St.
- TOLEDO, OHIO—909 Sizes 1½ to 8 in. dia.
W. G. Nagel Supply Div., 28 St. Clair St.

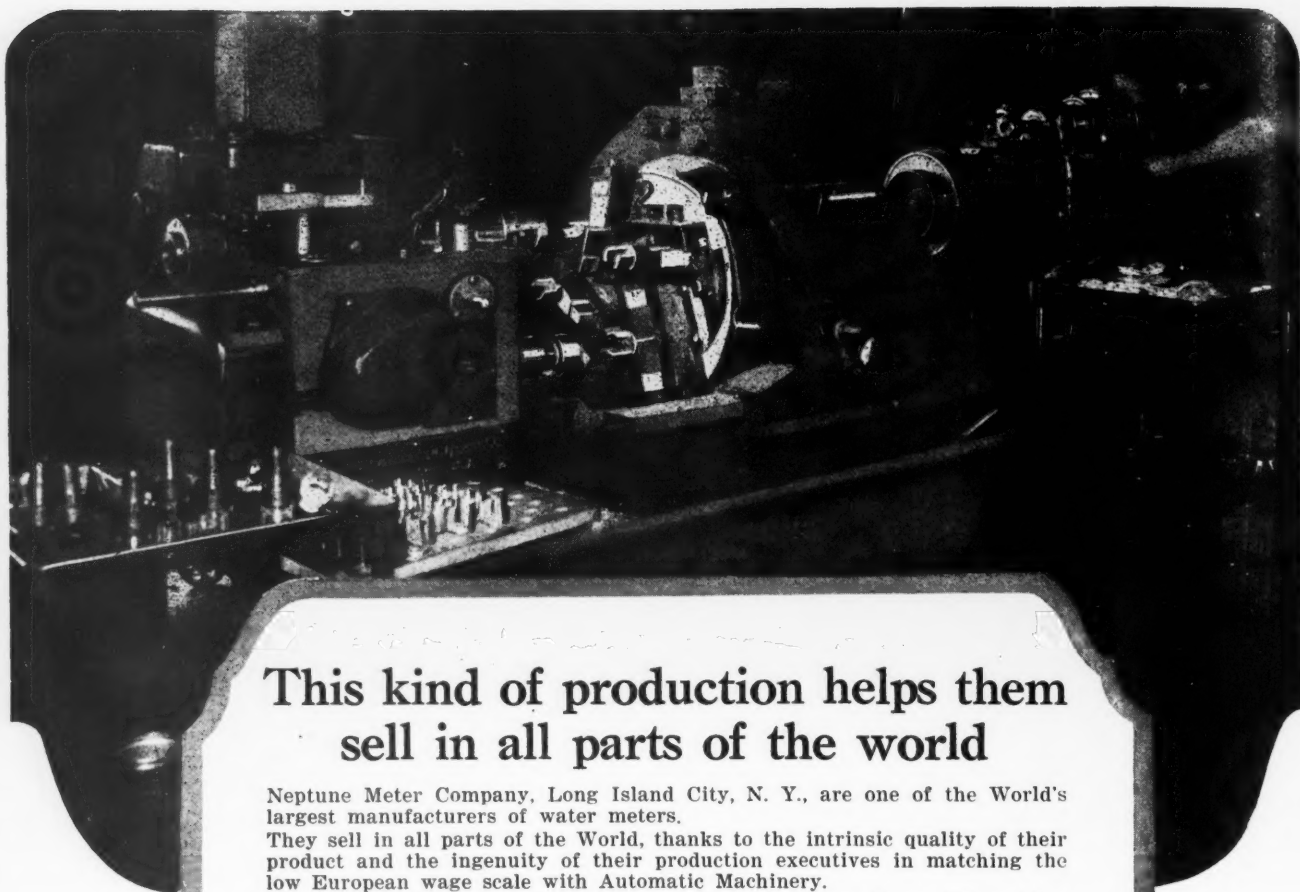
CANADA

- *MONTREAL, QUEBEC—909 Sizes 1½ to 8 in. dia.
Williams & Wilson, Ltd., 84 Inspector St.
- *TORONTO, ONTARIO—1297 Sizes 1½ to 10 in. dia.
Bond Engineering Works, Ltd., Foot of Cherry St.

★ In addition to **COMPLETE** range of sizes listed, also carry some larger sizes.



2194 stock sizes Rockwood Pulleys, 1½" to 14" diameters, are available for immediate delivery. Other sizes to 72" diam. can be promptly made to order.



This kind of production helps them sell in all parts of the world

Neptune Meter Company, Long Island City, N. Y., are one of the World's largest manufacturers of water meters.

They sell in all parts of the World, thanks to the intrinsic quality of their product and the ingenuity of their production executives in matching the low European wage scale with Automatic Machinery.

For instance, these bronze gear train supports: four operations of Spreading, Facing to Length, Turning outside diam., Turning inside seat, were performed at the rate of 60 per hour.

Putting the job on the

GOSS & DE LEEUW Automatic Chucking Machine

increased output to 165 pieces per hour.

In the words of Foreman George E. Salomon: "Figures show we have gained about 120%. It formerly required *three men to do the job.*"

Think of that, aside from increasing output over 100%, the actual direct savings of two men's time pays for the machine the *first year.*

With competition increasing and profits decreasing every manufacturer must have the best of equipment to be able to stand the pace. Which is an excellent reason for looking into the features of the Goss & de Leeuw Automatic that make for quantity production of the highest quality.

Send for illustrated catalog. It outlines the superior features and quotes actual hourly production figures on representative parts.

You should write for a copy now!

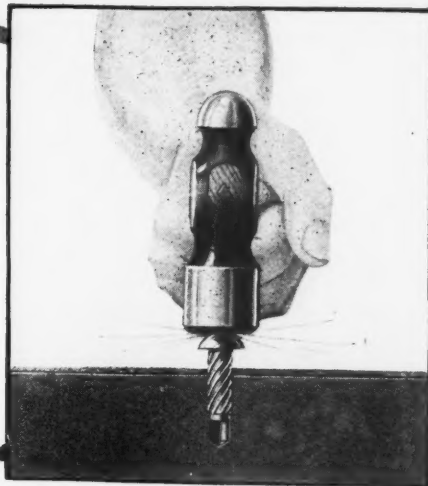
The Goss & de Leeuw Machine Co.
New Britain, Conn.

Representatives: Henry Prentiss & Company, New York State, Northern New Jersey, Erie, Pa., Connecticut, Massachusetts. Chicago Representative: John H. Glover, 2120 North Menard Avenue. Cleveland Representative: S. B. Martin, 10612 Clifton Blvd., Cleveland, Ohio. Michigan Representative: J. E. Bullock, 2994 East Grand Boulevard, Detroit.

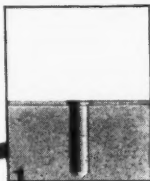
Bronze casting for water meter. Four operations to close limits at the rate of 165 per hour.

Tapping eliminated—

These Screws cut their own thread in steel, cast iron, etc., under the blow of a hammer!



Anyone can use them. Just two easy operations:



1 Drill a hole.



2 Hammer in the screw.

Send for
FREE SAMPLES

If there is the slightest possibility that you can use these time-and-labor-saving Screws, by all means try them. You will be amazed at the economies they will effect for you. We will gladly send samples without cost.

A few of the 15,000 manufacturers who are using Hardened Metallic DRIVE SCREWS:

General Electric Co.
Western Electric Co.
The Robbins & Myers Co.
The Hoover Co.
Delco-Remy Corp.
Ternstedt Mfg. Co.
Ford Motor Co.
The White Motor Co.
Timken-Detroit Axle Co.
Wright Aeronautical Corp.
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.
American Blower Co.
Cincinnati Milling Mach. Co.
Niles-Bement-Pond Co.
Otis Elevator Co.

American Locomotive Co.
Union Switch & Signal Co.
Victor Talking Mach. Co.
Toledo Scale Co.
Coldwell Lawn Mower Co.
Black & Decker Mfg. Co.
Mergenthaler Linotype Co.
Link-Belt Co.
Gilbert & Barker Mfg. Co.
Eastman Kodak Co.
Elliott-Fisher Co.
Stanley Works
The Westinghouse Elec. & Mfg. Co.

PARKER-KALON Hardened Metallic DRIVE SCREWS effect truly remarkable savings. They save not only the time and labor that tapping requires, but also the breakage of taps and upkeep of tapping machinery—items that materially increase the manufacturing cost of many articles. Furthermore, fastenings made with these Screws are better than those made with machine screws or escutcheon pins because they won't—can't—work loose under vibration.

The leading concerns in every branch of the metal working industry have adopted them for attaching name plates and for making other permanent assemblies. Why? Simply because they are easier, quicker and cheaper to use than anything else.

Made in 30 stock sizes. They can be used with satisfactory results in material 1/16" thick and heavier.

PARKER-KALON CORPORATION

353 West 13th St., New York City

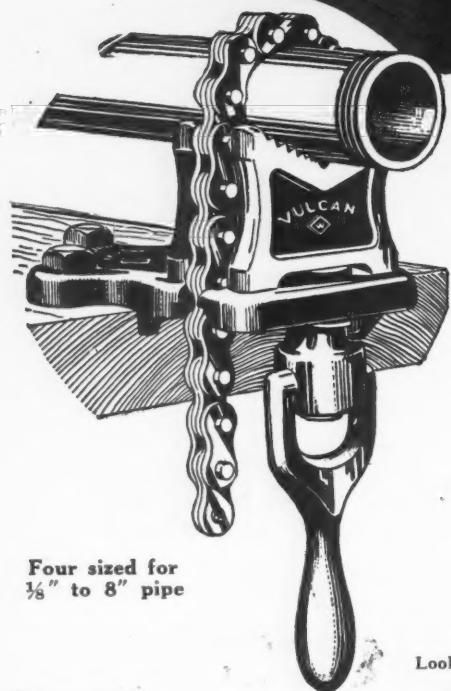
Distributed in Canada by
AIKENHEAD HARDWARE LIMITED
17-21 Temperance St., Toronto 2, Ontario.

Parker-Kalon
TRADE MARK
Hardened Metallic
REG. U.S. PAT. OFF.
Drive Screws

PATENTED JAN. 29, 1924-NO. 1482151
OTHERS PENDING

for Making Permanent Fastenings to Steel,
Cast Iron, Brass, Aluminum, Bakelite, etc.

Lightning *Speed* on the job



Four sized for
1/8" to 8" pipe

See our exhibit
National Machine Tool
Builders' Exposition
Cleveland Auditorium
Sept. 19-23, Booth 104

Look for this



Trade Mark

New York

J. H. WILLIAMS & CO.

"The Drop-Forging People"

BUFFALO

Chicago

WILLIAMS
SUPERIOR DROP-FORGED TOOLS
"VULCAN"
DROP-FORGED
CHAIN PIPE VISE



366

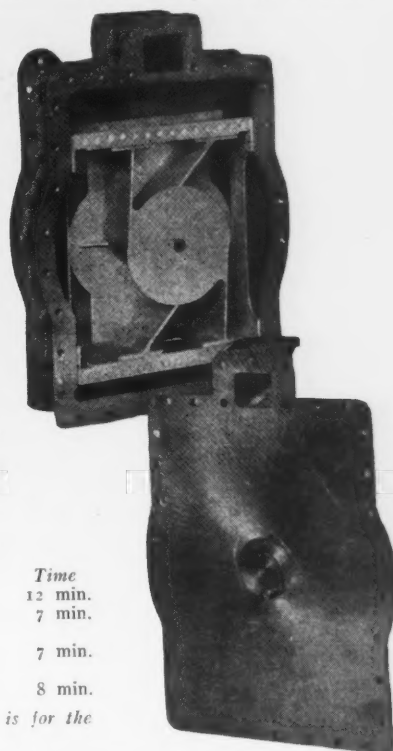


Pressure Tight Joints by Blanchard Grinding

Without exaggeration Blanchard Grinding can be called the ideal method of machining flat surfaces for slide valves, vane pumps, poppet valves and similar pressure tight joints. This statement is based on results obtained with many Blanchard Grinder installations used for finishing this class of work. Two are illustrated, and the manufacturer of one of them—the gasoline meter—says "...it also appeared that the Blanchard Grinder offered the only machine which in our opinion was suitable for this work". The Blanchard ground parts of this meter without additional finishing and without a gasket stand 58 lbs. air pressure. Advantages of Blanchard Grinding are that almost no lapping is required, the edges of holes or ports are not rounded, and small areas are not ground lower than the rest of the surface. The production figures speak for themselves.

We shall be very glad to discuss problems of a similar nature with you—or to aid you in applying the singular advantages of Blanchard Grinding to any flat machining job.

Work shown on the chuck of the Blanchard Grinder is Cast Iron Pump Bodies, $6\frac{1}{2}" \times 3\frac{3}{4}"$. Stock removed $1/16"$ per side. Limits $\pm 0.00025"$. Production: 34 pieces (68 surfaces) per hour.



PARTS OF GRANBERG GASOLINE METER

From Left to Right Parts are:
Bronze Cover $16\frac{1}{2}" \times 10\frac{1}{2}"$
Aluminum Valve $8\frac{1}{2}" \times 8"$

Aluminum Valve Guide $10" \times 8\frac{1}{2}"$

Bronze Base $15\frac{3}{4}" \times 11\frac{3}{4}"$

Grinding Operation

Rough and finish
2 sides rough and finish
2 sides rough and finish
Rough and finish

Time
12 min.
7 min.
7 min.
8 min.

Each piece is finished with extreme accuracy and the time given is for the total operation from rough to completely finished part.

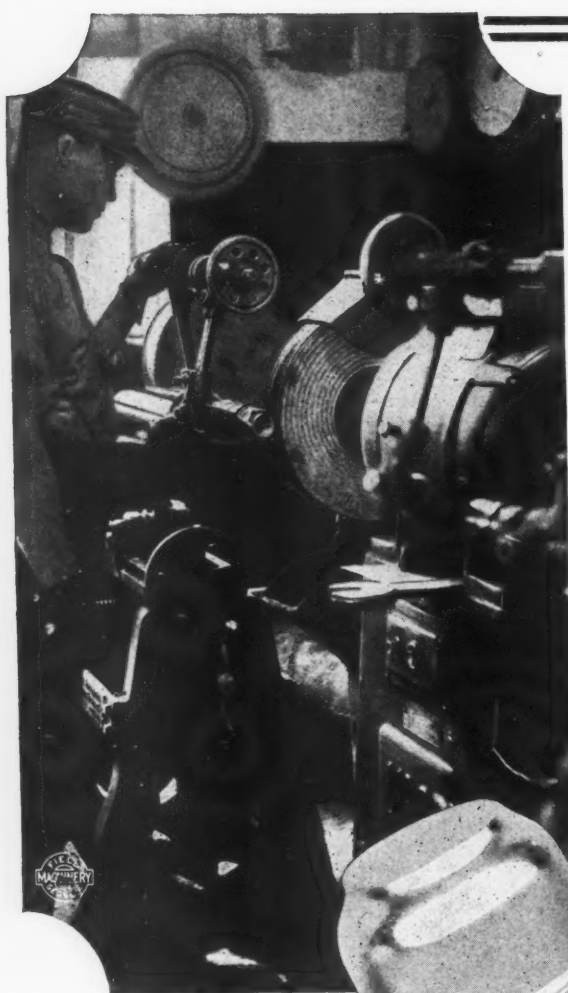


THE BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE, MASS.

DEALERS:

UNITED STATES—Henry Prentiss & Co., Inc.; Motch & Merryweather Machinery Co.; Marshall & Husehart Machinery Co.; W. E. Shipley Machinery Co.; Kemp Machinery Co.; Marshall & Husehart Machinery Co. of Indiana; Elliott & Stephens Machinery Co.; Robinson, Cary & Sands Co.; Harron, Rickard & McCone Co.; The Hendrie & Bolthoff Mfg. & Supply Co.; Huey & Philip Hardware Co.; Woodward, Wight & Co., Ltd.
CANADA—Williams & Wilson, Ltd.; F. F. Barber Machinery Co.
GREAT BRITAIN—Burton, Griffiths & Co. FRANCE—Aux Forges de Vulcain. ITALY, SWITZERLAND, BELGIUM, SPAIN and PORTUGAL—Allied Machinery Co. of America. SWEDEN—Maskinaktiebolaget Karlebo. JAPAN—Andrews & George Co. CZECHOSLOVAKIA—Ing. M. Kocian & G. Nedela. GERMANY—Schuchardt & Schutte A. G. SOUTH AFRICA—D. Drury & Co., Ltd.

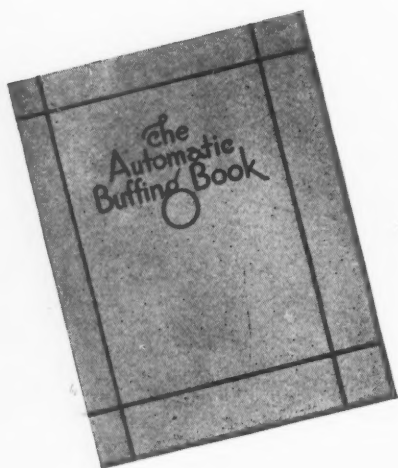


A Tiresome Job Made Easy —and Profitable

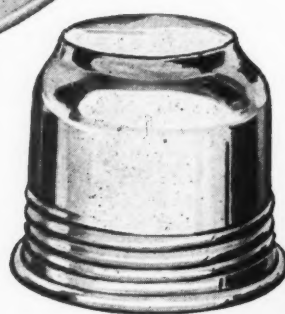
Hand buffing on small parts is so tiring to the wrists and hands that even a skilled hand operator does uneven work by the end of the day and production naturally lags.

In a well-known plant they overcame this problem of uneven quality and production about six years ago, by the installation of a single Automatic Buffing Machine. Now there are seven—all busy all the time—cutting down and buffing brass, nickel-silver and cold rolled stampings accurately, uniformly and economically.

The machine shown in operation is an Automatic Buffing Machine, Type B—one of the earlier installations. The Type H model is the latest Automatic development on the same line.



The Automatic Buffing Book shows machines of all types and installations handling a wide range of work. If you polish anything in quantity you should look over the operations illustrated here. May we send it?



AUTOMATIC BUFFING MACHINE CO.
Chicago and Perry Streets BUFFALO, N. Y.

Automatic Buffing Machines



FAIRBANKS-MORSE
Pioneer Manufacturers of
ball bearing motors



Just another way of saying
"years ahead!"

"Pioneer manufacturers of ball-bearing motors!" . . . Just a short, simple statement that appears in every F-M motor advertisement—but a statement that speaks volumes to every user of electric motors.

In simple terms these six words signify that Fairbanks-Morse offers a superior type of motor at its best. They mean also that in ball-bearing motor experience, Fairbanks-Morse is years ahead.

The Fairbanks-Morse Ball-bearing Motor is the finished result of cautious experiment—first with sleeve

bearings; then with roller bearings, and finally with ball bearings. Since adopting ball bearings, fine shadings in types, sizes and mountings have been made with a precision that only the guidance of many years of experience with anti-friction bearings could have made possible.

All this is history. But its significance to you is found in the clear-cut fact that by consistently concentrating on one better type of motor for fifteen years, Fairbanks-Morse has obviously brought it to the highest possible stage of perfection.

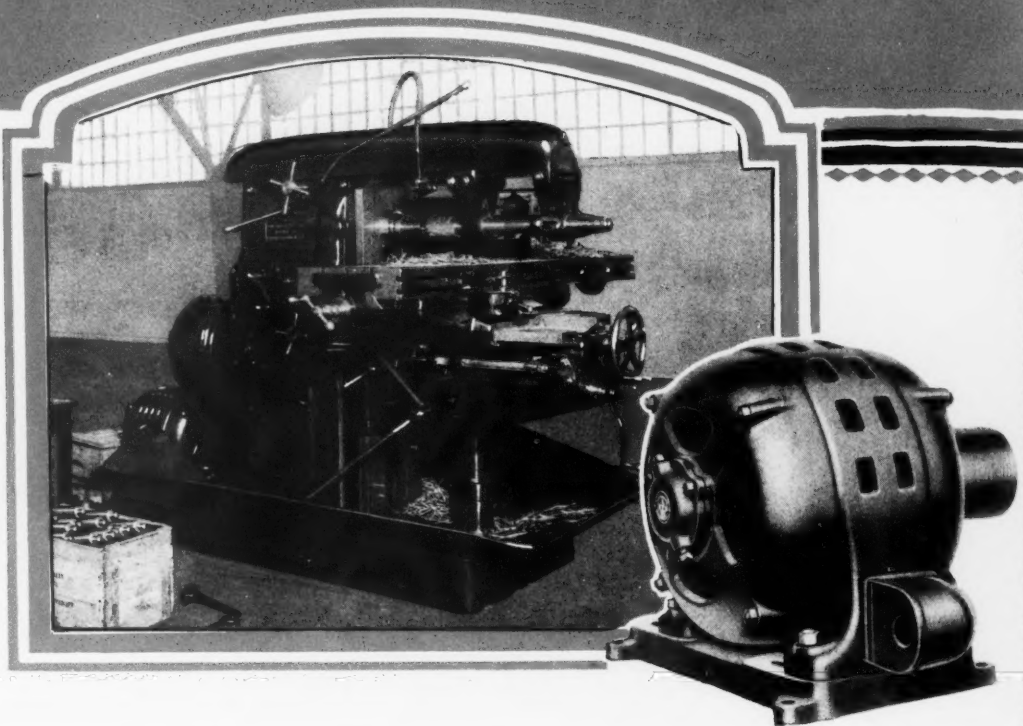
(One motor is better than the F-M Sleeve-bearing Motor;
it is the F-M Ball-bearing Motor.)

FAIRBANKS-MORSE

Pioneer Manufacturers of

ball bearing motors





Removing $37\frac{1}{2}$ cubic inches a minute —that's *performance*

According to the National Twist Drill & Tool Co., all milling records were smashed by this Cincinnati Milling Machine equipped with their "Parabolic" milling cutter.

During a test at the National Steel Exposition last year this cutter removed $37\frac{1}{2}$ cubic inches of metal per minute, using a feed of 30 inches per minute on the table and taking a $\frac{1}{4}$ -inch cut on a .30 carbon, machine steel block 5 inches wide.

It is both natural and right to give full credit to machine and tools in a test of this kind. But in doing

this do not forget that both were at the mercy of the motor—in this case, a Fairbanks-Morse *Ball-bearing* Motor.

In this withering test of mechanical stamina the sturdy frame, short rigid shaft, and ball-bearing construction of the F-M Motor were given an opportunity to demonstrate their true worth. As usual, results proved that it pays to consider not only the machine, but also the motor behind the machine!

Ask your machine tool dealer for facts about F-M Motors.

FAIRBANKS, MORSE & CO., Chicago
28 branches throughout the United States at your service

FAIRBANKS-MORSE

Pioneer Manufacturers of
ball bearing motors

AEA30.10





VITRIFIED WHEEL CO.
WESTFIELD, MASS.

A COMMON grinding job is an uncommonly profitable job when done with Vitrified Wheels.

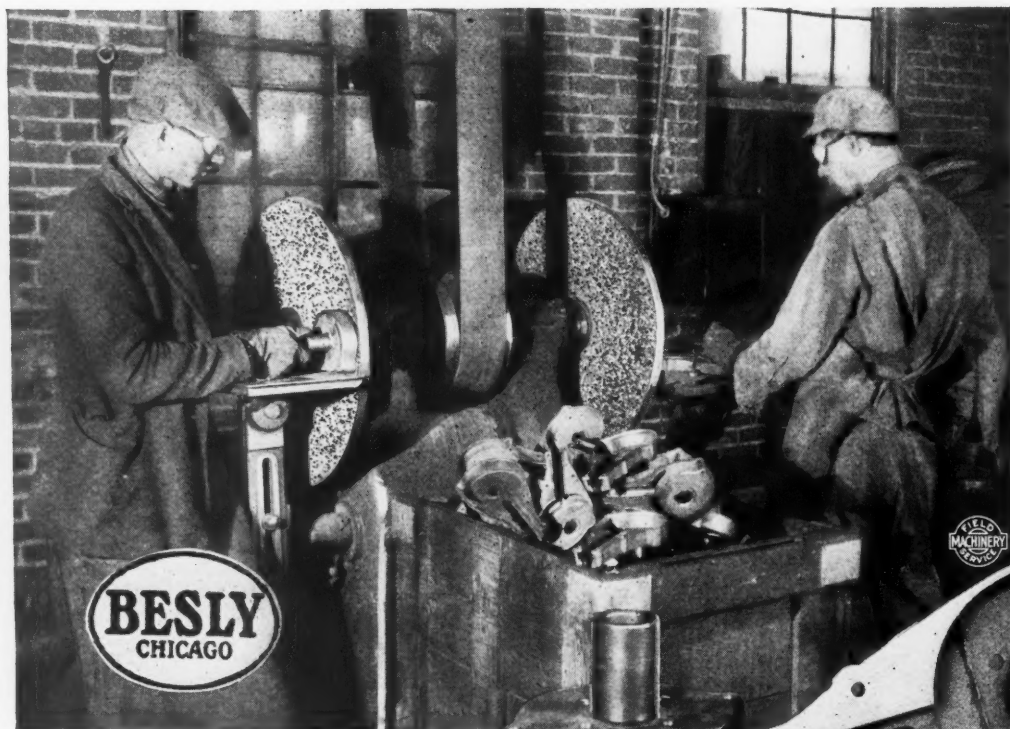
There are several good and acknowledged reasons for this—grinding is performed with speed and efficiency; costs are lowered—production sustained.

Vitrified Grinding Wheels are made by a special process which renders them porous. This porosity increases their cutting properties, makes them long-wearing, and counteracts any tendency to glaze over or heat when in service.

Circulars on request or a Representative will be glad to go over your grinding problems personally.

VITRIFIED

Do You Finish Castings Like These?



A Besly Grinder Completes 200 An Hour

These comparatively thin walled soft gray iron castings are wringer supports for the washing machine manufactured by the Automatic Electric Washer Co., of Newton, Iowa. The operator nearest you is facing one side—the other is grinding the opposite end of the casting to correct length. About 200 are completed per hour—50% better production than the method used before the installation of the No. 14 Besly Double End Grinder shown in the photograph. The company estimates that three months' operation paid for the machine—proof enough of its economical operation.



VISIT OUR SPACE
NO. 311

A point of particular appeal in this shop is the ease with which the discs can be changed—making it a simple matter to set up for a new job.

Besly Grinders are being used with substantial savings for machining and finishing the widest variety of parts—and they are sometimes applicable in the most unsuspected places. Send us prints or sketches of your parts for a production estimate.

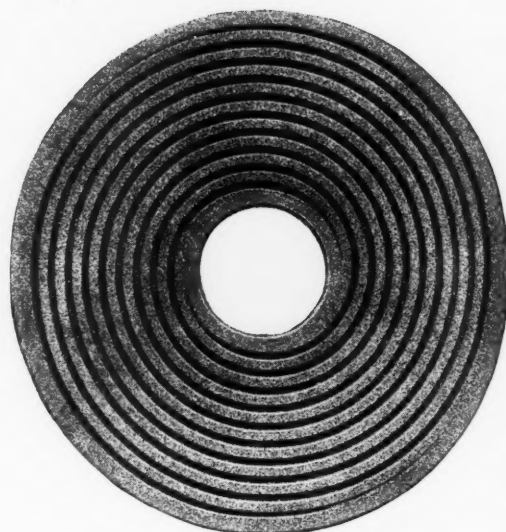
CHARLES H. BESLY & COMPANY

Originators of Disc Grinders

Works at Beloit, Wisconsin

120-B No. Clinton St.

Chicago, Ill., U.S.A.



The Besly-Titan Spiral Abrasive Disc

(Patent applied for)

TRY this Besly-Titan SPIRAL Disc; you'll find it the ideal disc for the average run of work. It has a very unusual shearing effect that greatly increases the cutting quality; and the clearance grooves prevent friction and excessive heating by enabling the grindings to escape.

This means better work produced at greater speed and with less effort.

Give your disc grinder operator a chance to use this new style disc. Sample sent if you ask for it.



Why Handicap Your Men and Machines?

GIVE them both at least an even break with that disc grinding job.

And the one way to do it is to equip with the right disc—right grit—the proper abrasive.

Give them a disc that cuts with a free easy action, removing stock with speed—a disc that will not slow up because of dulled grain and clogging.

Give them a disc that will produce

a good finish and at the same time increase production.

For heavy disc work you will get these results by specifying Carborundum or Aloxite Improved Quadruplex Discs.

Carborundum for cast iron, brass, bronze, etc.—Aloxite for all steels and malleables.

For the lighter jobs and where finish is a factor, we can give you regular or double-coated discs in all standard sizes and all necessary grits.



[*Tell us what you are disc grinding and we will build discs to better meet your conditions*]

THE CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.
Reg. U. S. Pat. Off.

CANADIAN CARBORUNDUM CO., LTD., NIAGARA FALLS, ONT.

Sales Offices and Warehouses in New York, Chicago, Boston, Philadelphia, Cleveland, Detroit, Cincinnati, Pittsburgh, Milwaukee, Grand Rapids
The Carborundum Co., Ltd., Manchester, Eng.

Real Polishing Economy

The new Type A Production Polishing Machine handles cylindrical and tapered metal objects up to 6" diameter and some flat work. The polishing belt is made to conform automatically to the shape of the piece and by using suitable belts any finish can be produced. The work is handled almost automatically and very rapidly. The feed is *centerless* and actuated by a belt drive. Adjustment for different work diameters is quickly made by turning a hand wheel.



Large capacity, speedy operation, wide range, small space used, economy of power, simplicity and the high quality of the finish produced contribute to making polishing and finishing with Production Machines a method of unparalleled economy for work in its range.

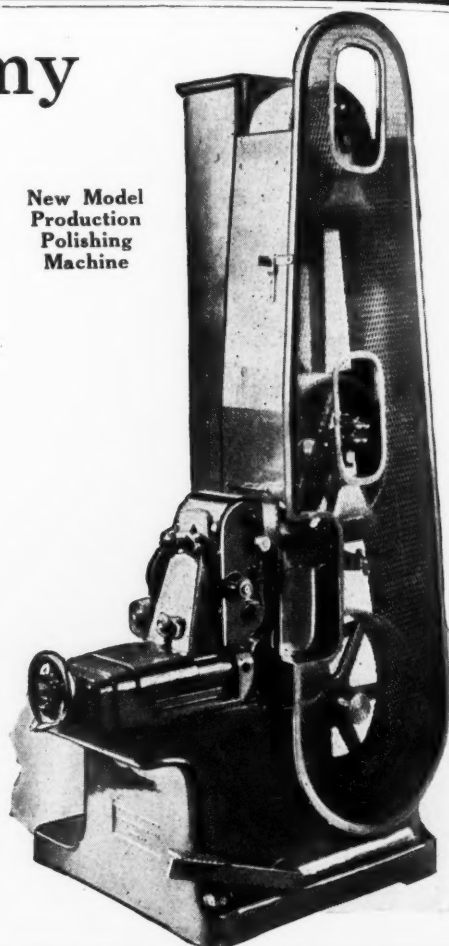
We shall be glad to submit a complete report on your work.

PRODUCTION MACHINE CO.

GREENFIELD, MASSACHUSETTS, U.S.A.

Motch & Merryweather Machinery Co., Cleveland, Detroit, Pittsburgh, Cincinnati.
F. C. Hermann, 558-560 W. Washington Blvd., Chicago, Ill.

New Model
Production
Polishing
Machine



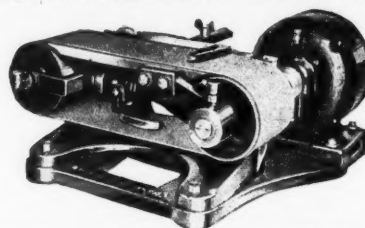
ELECTRICALLY DRIVEN
DRILLS
GRINDERS
BUFFERS

The
UNITED STATES
ELECTRICAL TOOL
CO.
Cincinnati, Ohio, U.S.A.

2477 West Sixth Street

Export Sales Representatives
Westinghouse Electric International Co.
150 Broadway, New York City

Simplex-M Abrasive Band Grinder



**For Roughing, Smoothing or
Fine Finishing**

Produces Straight Grain Surface and Sharp Edges
Used on Metals, Woods and Compositions

Details of this and other styles and sizes on request

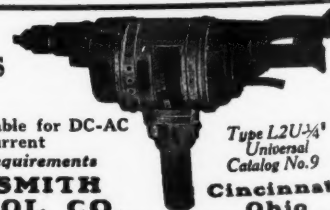
WALLS SALES CORP., 96 Warren Street
NEW YORK

PORTABLE ELECTRIC DRILLS and GRINDERS

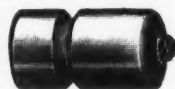
Complete line of sizes suitable for DC-AC
and Universal Current

Tested to U. S. Navy requirements

THE NEIL & SMITH
ELECTRIC TOOL CO.



Type L2U-3/4"
Universal
Catalog No. 9
Cincinnati
Ohio



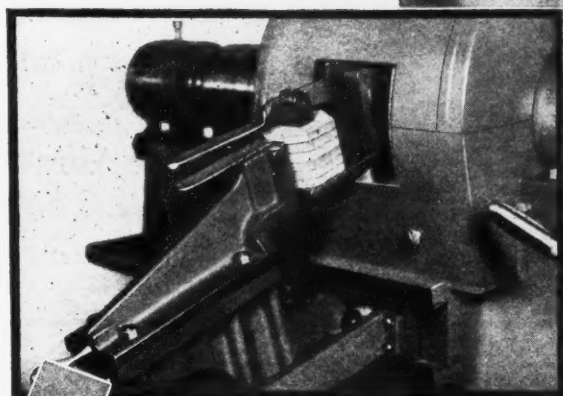
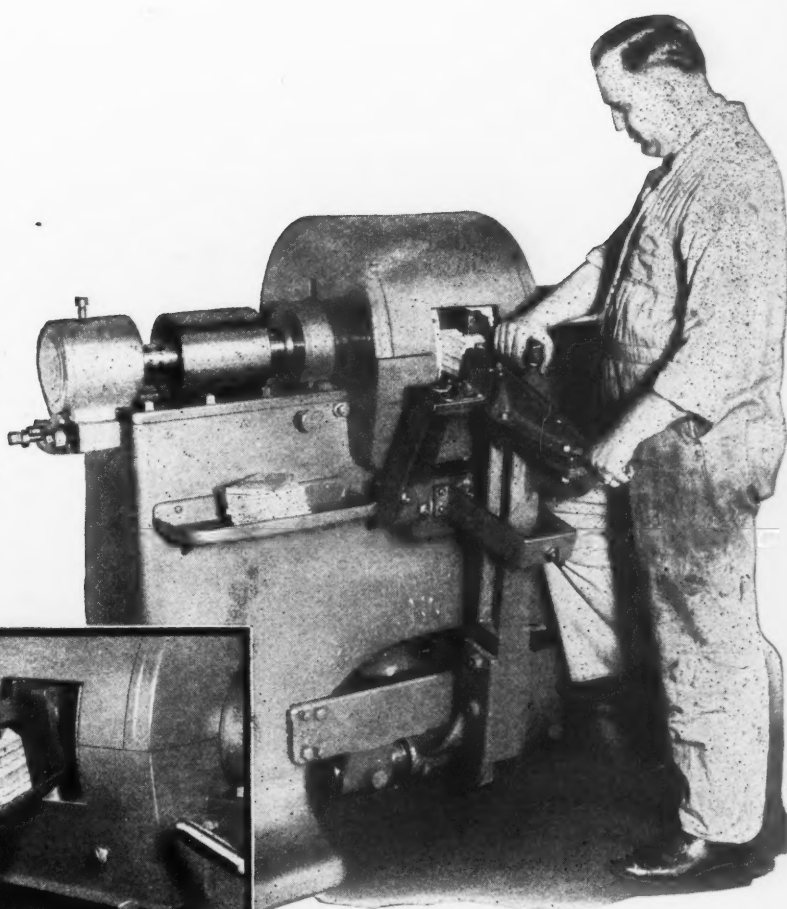
Francis Quality Diamonds

Set in Francis Grinder Tools cut wheel dressing costs, insure satisfaction.

Send for catalog and prices—and samples for selection

FRANCIS & COMPANY

First Nat'l. Bank Bldg. Estab. 1799. 50 State St., Hartford, Conn.
Keep Your Wheels Right for Good Grinding!



1000 Tile per hour, completely ground on 4 edges!

THIS No. 14-20" Double Spindle Gardner Grinder spells "high production" to a large manufacturer of floor tile.

It's a standard machine, equipped with a special swinging fixture adjustable to handle several sizes and shapes of tile.

High production—satisfactory finish—good accuracy—result from this equipment, as the production story at the right explains.

PRODUCTION DATA:

Size of tile: 4x4x7/16"; 3x3x7/16"; hexagonal tile with 3" hexes.

Stock removal: 1/32" from each surface.

Requirements: grind edges. Hold within .001 per inch of square.

Grinding Members: Heavytype Gardner G. I. A. Discs.

PRODUCTION: *Square pieces*, 1000 per hr., complete on 4 edges. *Rectangular pieces*, 1000 per hr., complete on 4 edges. *Hexagonal pieces*, 500 to 700 per hr., complete on 6 edges.

GARDNER GRINDERS are equally productive on metals and many other products—

ASK FOR CATALOG OR OPERATION FOLDER!

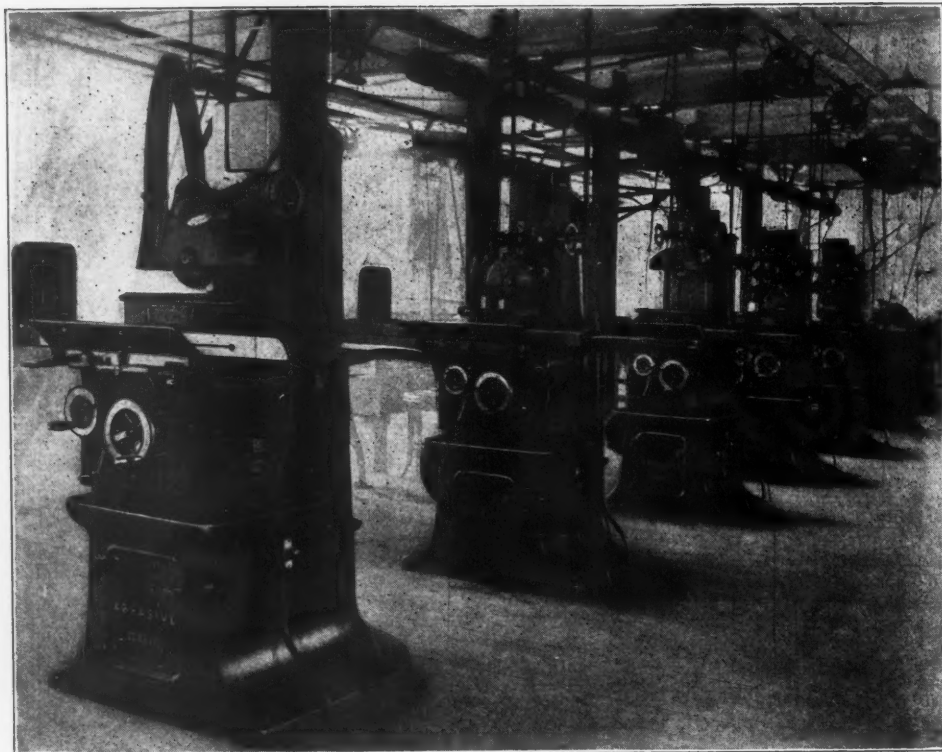
GARDNER MACHINE COMPANY

Specialists in Grinding Equipment

414 East Gardner Street

Beloit, Wisconsin, U. S. A.

ABRASIVE



This cut shows an ABRASIVE installation in the plant of a prominent manufacturer of high-grade electrical products.

We take just pride in the fact that many makers of quality products repeatedly specify ABRASIVES, the quality Surface Grinders.

**Abrasive Machine
Tool Company**

East Providence, R. I.

*A Versatile
Grinder*

BATH
Self-contained
Universal



**Grinding
Machine**

THE Bath Grinder embodies many distinctive and desirable features essential for rapid and accurate production of commercial and tool room grinding.

This machine is adapted for the grinding of cylindrical, internal, surface, disc, cutter and reamer work of all kinds. Made in 2 sizes—12x36; 10x25.

Drop a post card for catalog

Fitchburg Grinding Machine Corp.
Fitchburg, Mass.

DESMOND-HEX DRESSER

**The Most Durable Type of
Mechanical Dresser
Made**



In the Desmond-Hex (Huntington-type) Dresser the hexagonal, hardened-steel nuts inserted in the jaws of the Dresser have six holes, each of which, in turn, becomes the bearing for the spindle carrying the cutters. Will outwear a dozen ordinary Dressers. Made in three sizes.

The Desmond-Stephan Mfg. Company
URBANA, OHIO

The Canadian Desmond-Stephan Mfg. Co., Ltd., Hamilton, Ont. Alfred Herbert, Ltd., Coventry, England, Agent for Great Britain.

BADGER TOOL COMPANY

**Grinding Machinery
Supplies and Accessories**

E. B. GARDNER, President R. D. GARDNER, Treasurer
BELOIT, WISCONSIN, U. S. A.



**BRYANT CHUCKING
GRINDER COMPANY**
Springfield, Vermont

**Builders of
Hole Grinders
Hole and Face Grinders
Deep Hole Grinders**

Patented

Ross Master-truing for your 16" plain Landis Pin Grinders

THE advantage of using Ross Master-truing Tools on your 16-inch Landis pin grinders does not stop at a sure saving of 50% of diamond wheel-truing costs. You will find that the finer surface given the work makes lapping for size and finish an easier, quicker operation—especially with the improved lapping machines now in use. For no truing marks are left by the Ross Master, and the “rolling contact” of the two wheels exposes the new cutting face without the slightest blunting of the fresh crystals.

The Ross tool here illustrated fits both old and new style plain type 16-inch Landis pin grinders. It is a development by grinding experts that meets the demand of modern industry for faster *quality* production at *lowered* cost. You cannot overlook this unit as an economy factor in present-day pin grinding. Clamp one on. Check it in any way against any other truing device. The results will tell the story.

THE ROSS MANUFACTURING CO.
2196 Clarkwood Road · Cleveland, Ohio, U. S. A.

Ross Master-truing Tool for plain type 16-inch Landis pin grinders, old or new style.



Borolon **Wheels**

TRADE MARK

For Grinding Cutting Dies

Service has kept Borolon Grinding Wheels the exclusive choice in the die grinding department of this well known plant for more than fifteen years—for the reason that Abrasive Wheels get better results at lower cost than any others tried.

Contract manufacturing is a highly competitive business and the contract manufacturer is a good judge of equipment.

Here is an example where Borolon Grinding Wheels were chosen in preference to others because they cut faster and cooler.



This operation, grinding dies for goloshes, shows one of the many styles of Abrasive Borolon Wheels used here—note some others on the table.

If you grind—no matter what—there's an Abrasive Wheel to do it more efficiently. Let us show you.

Borolon ***S.B. Borolon*** ***Electrolon***

TRADE MARK TRADE MARK TRADE MARK

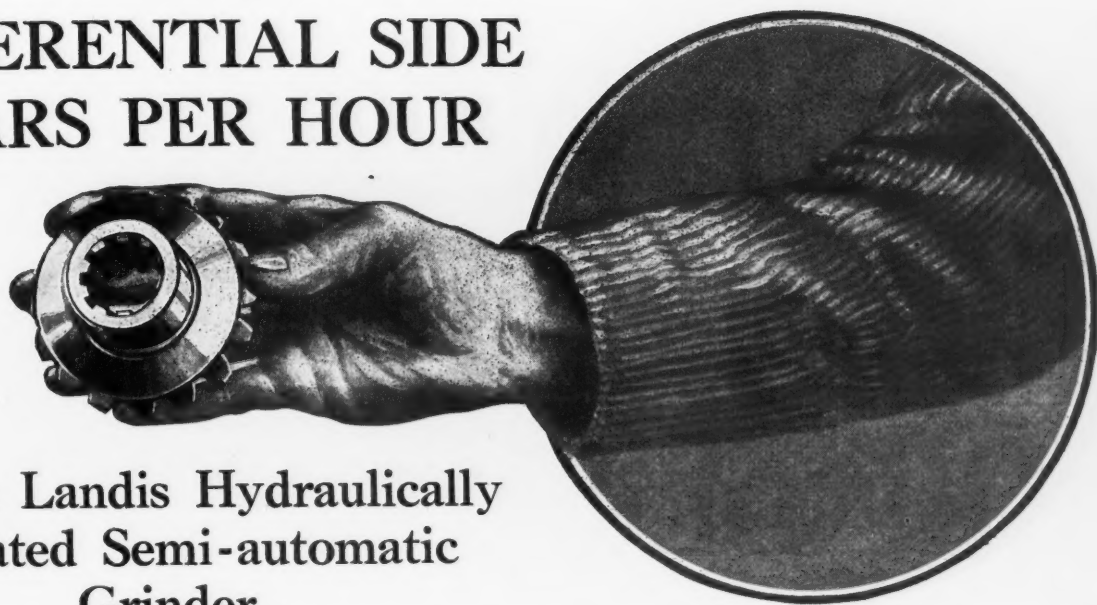
ABRASIVE COMPANY

DETROIT

PHILADELPHIA, PA.

CHICAGO

200 DIFFERENTIAL SIDE GEARS PER HOUR



On the Landis Hydraulically Operated Semi-automatic Grinder

LANDIS has solved another problem—the grinding of the hub and back face of differential side gears simultaneously on a high production basis. From .015" to .020" stock is removed from the hub, .005" to .007" from the face; the finish is excellent. Every gear is accurate to within .001" on the pitch line.

These results are made possible by the semi-automatic with such features as:—

A hydraulically operated work head which moves toward the wheel instead of the wheel moving toward the work.

An automatic work clamping device which centers the work accurately on the pitch line. Shown on close-up below.

A single, convenient lever which controls the entire grinding cycle.

A hydraulically operated truing device which bevels the face of the wheel in both directions from the center, forming an angle of 90°.

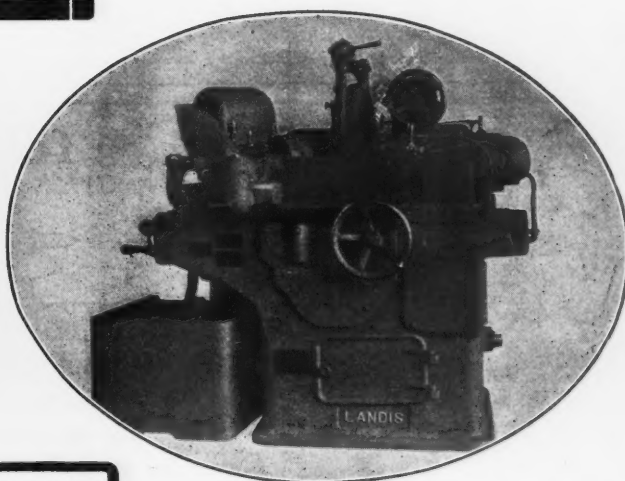
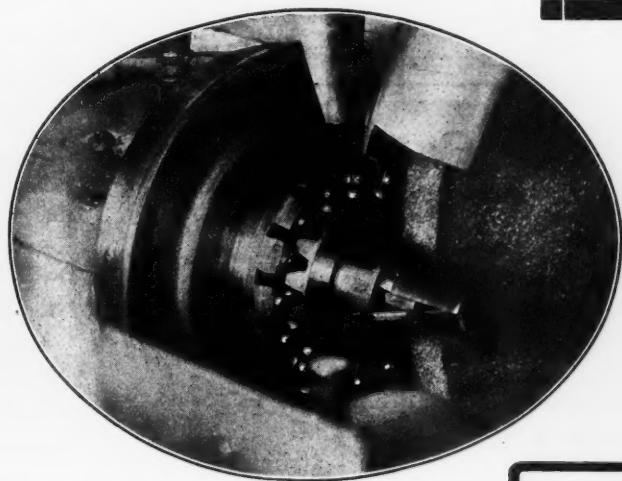
The operator does nothing but load and unload the arbor and touch one control.

*Do Your Machines Produce as Much
with as Little Effort?*



LANDIS TOOL COMPANY

Waynesboro, Pa.



LANDIS

THE STANDARD BALL BEARING BUFFERS



General Electric 40 degree Motors. Push Button Control. Four S. K. F. Ball Bearings. Nickel Steel Armature Shaft. Made in 8 Sizes, from ½ H.P. up to 15 H.P.

DRILLS—GRINDERS

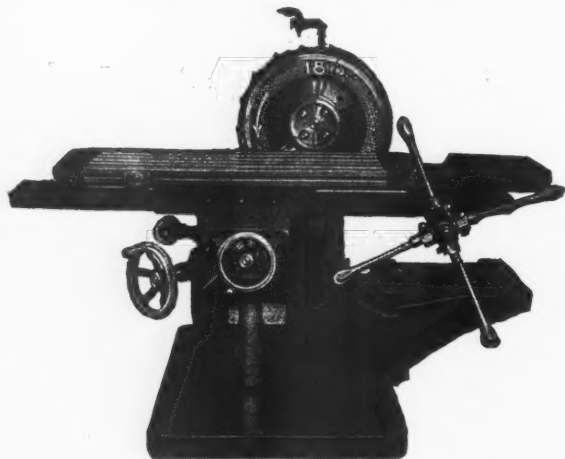
Established 1912

The Standard Electrical Tool Co.
Cincinnati, Ohio

FLAT WORK GRINDERS

TWO SIZES 12"–18" HIGH GRADE

For rapid production of short flat surfaces that will be straight from end to end



18-inch Grinder

Showing Motor Bracket. Water Guard Omitted.

You can readily fasten stationary, rotary or Magnetic Holders on the table to suit your particular case.

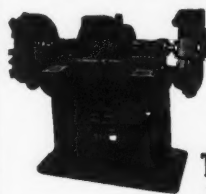
ADAPT AND USE AS A BASE

A good example is our PULLEY GRINDER on which we have special circulars.

THE GRAHAM MFG. CO.

71 Willard Avenue Providence, R. I.

Great Britain—Richard Lloyd & Co., Ltd., Birmingham.
France, Italy, Switzerland, Spain and Holland—Fenwick Freres & Co.



A Wide Range of Grinders

The 450 styles and sizes of grinding machines built in the Bridgeport plant enable us to furnish exactly the machine you need. Designed to meet modern grinding needs, built to Bridgeport Standards—profitable investments in grinding equipment.

Send for Catalog

The Bridgeport Safety Emery Wheel Co., Inc.
1283 West Broad St. Bridgeport, Conn.

Emery Wheel Dressers CUTTERS

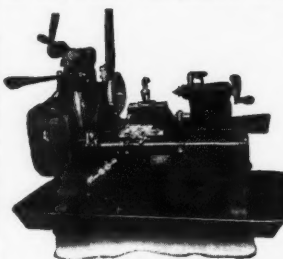
Two Sizes

Nos. 1-2

We make the regular Huntington (Pattern) for all sizes. Roughing for Nos. 1 and 2. Paragon for No. 1 only.

GEO. H. CALDER CO., Lancaster, Pa., U.S.A.

Porter-Cable Production Estimates



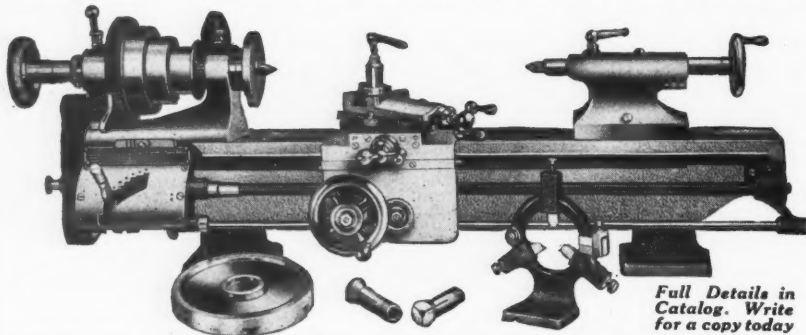
Send samples of single or multiple operation work to 20" long; study and compare the engineers' tooling layouts and production and cost estimates. Decide that you must have the details on PORTER-CABLE SHORT BED HIGH SPEED PRODUCTION LATHES.

Send for the booklet.

THE PORTER-CABLE MACHINE CO.

SYRACUSE, N. Y., U.S.A.

Use Wade Lathes for Your Precision Work



Besides the ordinary run of lathe work, attachments can be quickly applied that enable you to perform any conceivable operation to advantage.

Without equal in accuracy, selection of material and design for the work it has to do.

Full Details in Catalog. Write for a copy today

THE WADE TOOL COMPANY, 49-59 River St., Waltham, Mass.



DIAMOND SWING FRAME GRINDING MACHINES

remove fins, gates, risers and sprues in the Foundry; skin billets in the Steel Mill; and grind and polish valve motion mechanisms in the Railroad Shop; a handy machine for all sorts of work.

You can quickly see their advantages—ball bearing, motor driven machines; nicely balanced (easy to operate); have practically unlimited working area; grind-

ing head can be set to grind either top or sides of work (eliminating the turning and twisting of heavy pieces); push button control right at operator's position; ball bearing spindle construction (greatly increases life of wheel by preventing "shaking" common with old-style bearings); and Safety Code Wheel Guard.

May we tell you all about them?

DIAMOND MACHINE COMPANY

Grinding Machine Specialists

9 Coddling Street

PROVIDENCE, R. I.

The New Coarse Cross Feed for Surface Grinding is now ready.



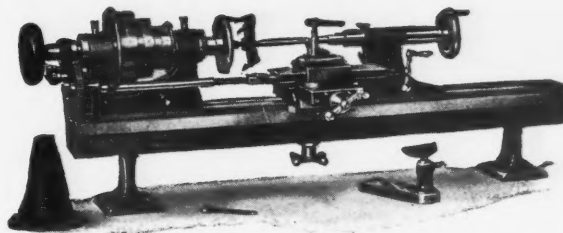
Efficient and Economical

The Thompson Universal Grinding Machine is all that its name implies—a thoroughly practical, satisfactory and efficient grinding device for every shop—cylindrical and taper grinding between centers, surface, edge, internal and cutter grinding. Precision is equal to the strictest requirements. Output and speed of operation assure profitable production.

Let us send you the complete description of this up-to-the-minute grinding machine.

The Thompson Grinder Co.
Springfield, Ohio, U.S.A.

Elgin Precision Bench Lathes



Unbeatable for Accuracy and Versatility

ONE of the most important machine tools in the modern tool room is the bench lathe, and the Elgin, because of its remarkable versatility, is a leader in the field of this type tool.

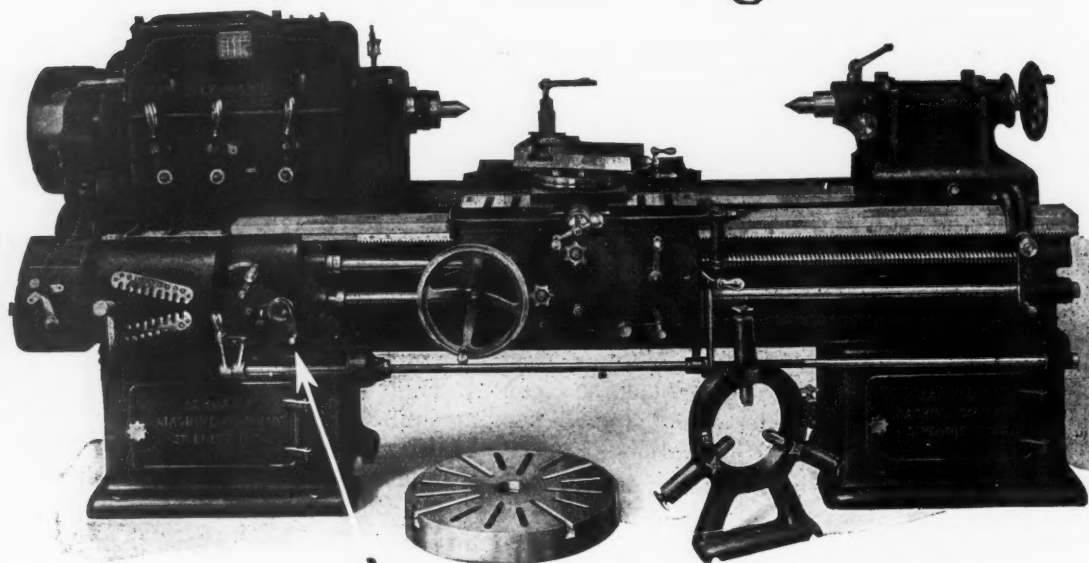
With its equipment of thirty attachments, this lathe can perform an infinite number of important tool room operations, such as grinding, milling, screw cutting, indexing, planing, filing, etc., and perform each with a degree of precision and efficiency unattainable with tools of other makes. This puts Elgin Bench Lathes in a class all by themselves.

Let us, through our catalog, tell you more about them

ELGIN TOOL WORKS, Inc., Elgin, Ill.

The "LEHMANN"

An EXCEPTIONAL Engine Lathe



Another of the 10 Big Features

Ten "Reasons Why"

- 1** Improved Friction Clutch—Forward and Reverse—Running in oil—Self Adjusting.
- 2** 16 Speed Headstock—Running in Oil—Simplicity of Construction—Only 10 Gears Required—All Gears Heat-treated or Hardened—All Shafts, except Spindle, Mounted on Ball Bearings.
- 3** Spindle—Alloy steel—Hardened and Ground—Running in Bronze Boxes—Patented Double Spindle Nose.
- 4** Bed—Deep and Wide—Braced by Large Cross-ribs—Chilled Ways.
- 5** Patented Quick Change—Wide Range—Central Oiling System.
- 6** **ROD AND SCREW SHIFT. POSITIVE—SAFE. Ease of Manipulation.**
- 7** Carriage. Wide Bridge—Good Depth—Improved Oiling System.
- 8** Apron—Double Plate Type—Removable Front Plate—Central Oiling System.
- 9** Apron Control of Clutch for Forward and Reverse—Similar Handle at Headstock End.
- 10** Improved Locking Device for Tailstock Spindle.

"Lehmann Lathes" are built in five sizes—16/18 1.9" — 18/20¼" — 20/22" — 22/24½" and 24/27⅞". Any length bed. Two Styles — Sixteen Speed Geared Head — and Three Step Cone—Double Back Geared

*Send for Catalog
containing
Complete Details*

Lehmann Machine Company
3571 Chouteau Ave., St. Louis, Mo.

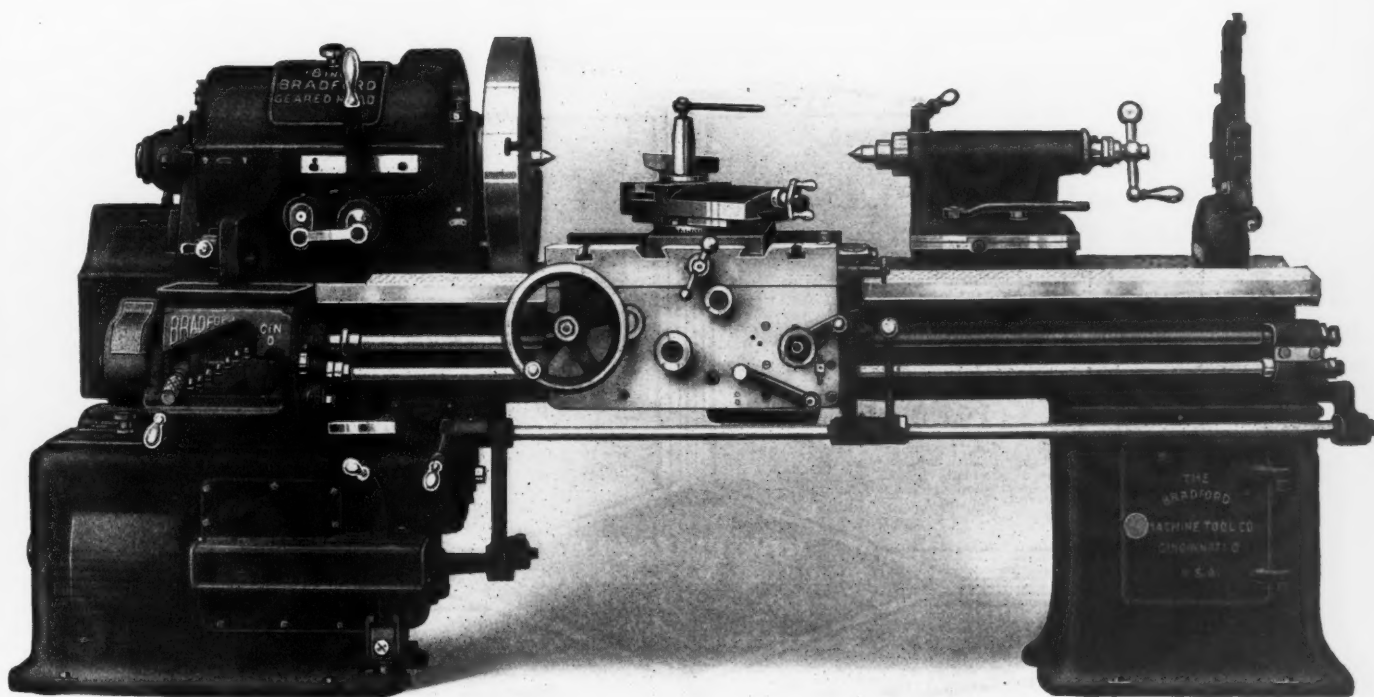
BRADFORD

ALL-GEARED LATHES

14" to 48" swing

Now furnished with forced feed lubricating system—One operation of lever placed conveniently in front of lathe distributes a measured quantity of FRESH oil to 33 surfaces. No chance of overlooking oil holes—with this system all the surfaces receive required amount of FRESH oil with a single shot from the pump.

With old method of can and oil hole the operator is very apt to take a chance rather than go to the trouble of lubricating; his attitude with this system is, "I will give it a shot anyway." This system eliminates lubricating troubles, saves oil and last but not least, saves the lathe.



THE BRADFORD MACHINE TOOL CO.

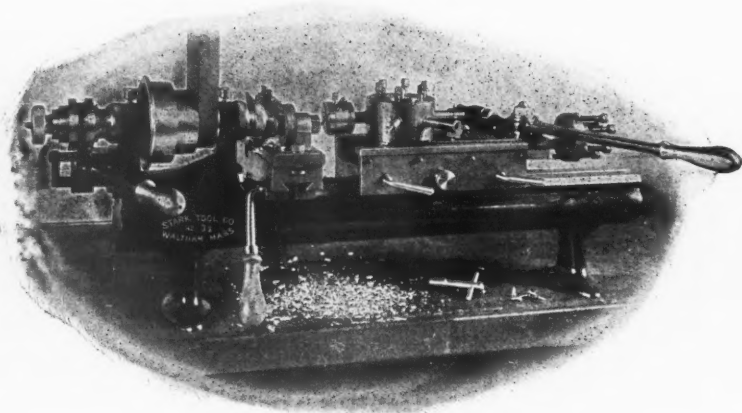
657-671 Evans Street, Cincinnati, Ohio, U. S. A.

Established 1840

LATHES FOR ALL PURPOSES. ALSO SPECIAL PRODUCTION MACHINERY

Stark Precision Bench Lathes

Efficient Small Lot Production



is where a STARK shines. The No. 3½ Screw Machine Unit shown turns out a small brass pivot screw in ten seconds and holds the three diameters and three shoulder lengths to plus or minus .0005".

For such jobs they are less expensive to buy and operate and much handier than a large turret lathe.

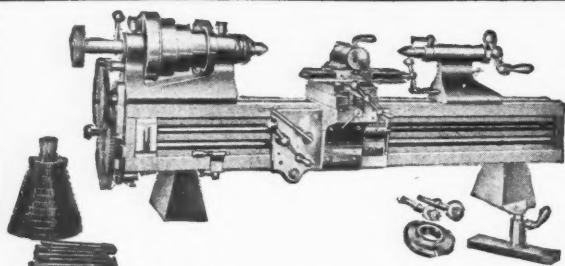
Tooling up is simply and quickly done.

Put some of your "sticky" problems up to us.

STARK TOOL COMPANY, Waltham, Mass.

Established 1862

Originators of the American Bench Lathe



No. 608 Back Geared Precision Lathes

Especially built to meet the exacting requirements of tool rooms, experimental and model departments. When used with its full line of Rivett attachments it makes a unit capable of doing practically every shop operation adaptable to any kind of bench lathe. Ask for catalog No. 608.

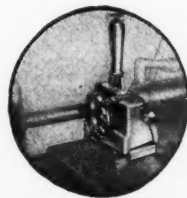


Collets to Meet Your Needs

Collets in stock for all models of Rivett machines and for many other leading makes of bench lathes, engine lathes, grinders, millers, etc. A large number of the best known machine tool builders contract with Rivett for their collet supplies. "Rivett makes the best collets in this world!" Send for special booklet about collets.

Cuts Duplicate Threads Cheaply

The Rivett Thread Tool saves time on threading done on engine lathes particularly where a number of duplicate threads are to be cut. Far superior in every case to a single point threading tool. Can be attached to any make screw cutting engine lathe. Details?



RIVETT TOOLS

Rivett Lathe and Grinder Corp.
Brighton District
Boston, Mass.

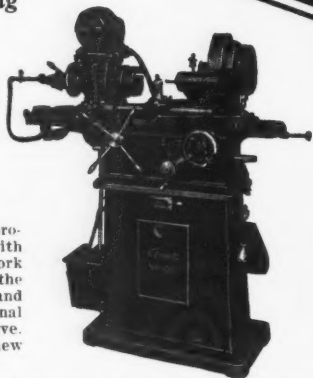
For Greater Grinding Efficiency

The New Rivett No. 104

Internal Grinder

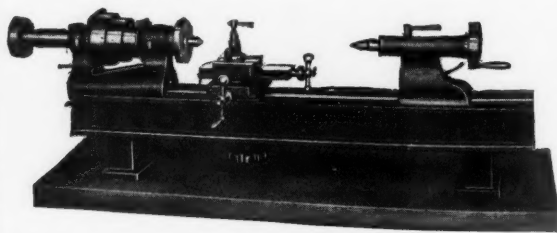
Inexpensive—efficient—complete.

For general tool room and production work—motor driven with automatic table travel, work head and water control—or the same machine simplified and countershaft driven. External attachments for either drive. Send for bulletin on this new machine.



The New Rivett Junior Bench Lathe No. 507

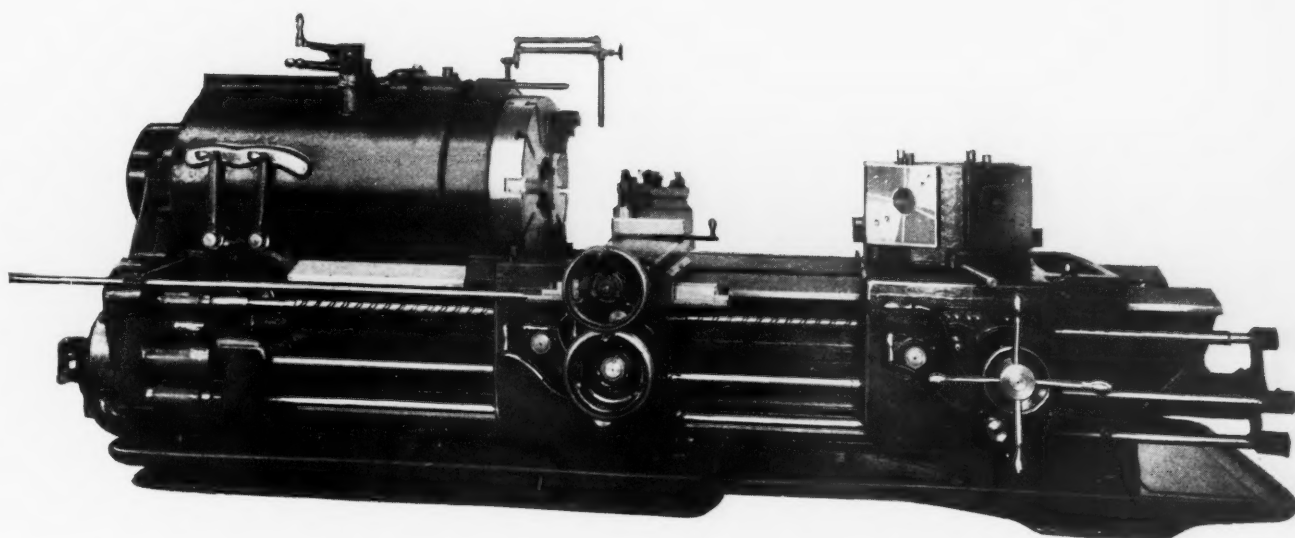
—junior in cost and in age but already the leader in its field. Designed without prejudice—built with experience—complete with attachments—priced for everyone. Rivett is very proud of this product. Send for its bulletin and hand book.



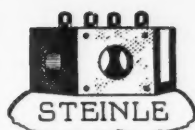
**The
Full Swing
Side Carriage
Turret Lathe**

STEINLE

Production Lathes that Reduce Costs



Built in 20", 24", 28", 30",
36" and 40" swing with spindle
bores from 4" to 12 $\frac{1}{4}$ ".



For Bar or
Chucking Work

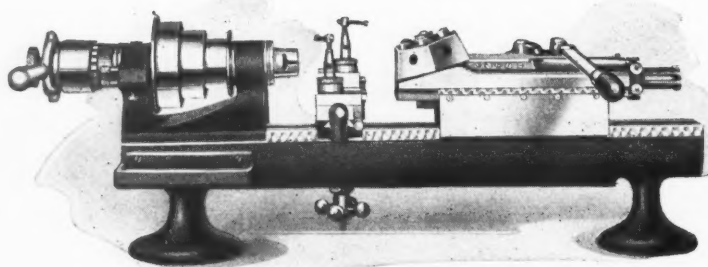
If you have a turning, boring, or facing job in your plant, a Steinle Lathe can save you money. We are always pleased to have our Engineering Department submit estimates of tooling equipment and production from your blueprints, so that you may know just what one of these High Duty machines can accomplish in your own plant.

Why not send in those prints?

STEINLE TURRET MACHINE COMPANY
MADISON, WISCONSIN, U. S. A.

Originators of the Full Swing Side Carriage Turret Lathe

AGENTS: Neff, Kohlbusch & Bissell, Inc., 806 W. Washington Blvd., Chicago, Illinois;
and 610 Sycamore Street, Milwaukee, Wisconsin.



Lataract

Bench Lathes
Precision Lathes
Millers, Attachments

Write for Catalogue

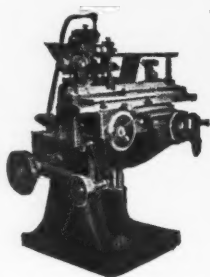
HARDINGE BROTHERS, Inc., 4149 Ravenswood Avenue, Chicago

Reputation—a Matter of Results

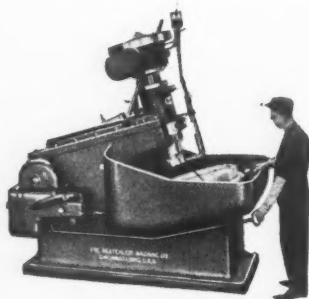
Modern standards, operating efficiency, production costs combine to "make" the reputation of Ohio Production Machines.

The Ohio Tilted Rotary Miller (below) has practically revolutionized milling practice wherever large quantities of oddly shaped parts must be accurately machined.

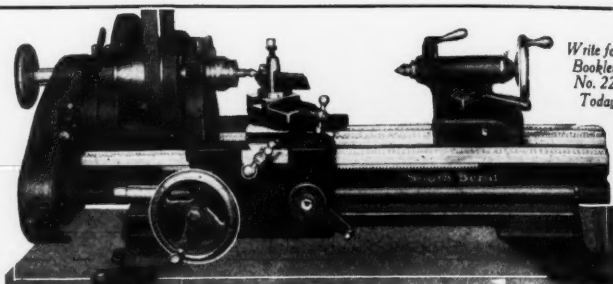
The Ohio Universal Tool and Cutter Grinder by its convenience reduces tool maintenance costs and offers advantages for general cylinder and surface grinding.



Send for details of Ohio Equipment—asking also about our Vee-flat Over-arm Milling Machine.



The
**Oesterlein
Machine Co.**
Cincinnati, Ohio



Write for
Booklet
No. 22
Today

Lathe with Draw-In Collet Chuck

No. 22, 9" x 3' New Model Jr. South Bend Back Geared Screw Cutting Lathe. Collet capacity, 1/2"; complete with Compound Rest, Countershaft and Equipment \$175 Hand Wheel Draw-In Collet Chuck Attachment Complete with one Collet, size optional 33

Total F.O.B. South Bend.....\$208

SOUTH BEND LATHE WORKS
776 E. Madison St. South Bend, Ind.
N.Y. City Sales Room, 183 Center St., N.Y.

Features of Lathe

3/4" Hole Thru Spindle
Power Feed to Carriage
Graduated Compound Rest
Cuts Threads 4 to 40
per in. Built in 3, 3 1/2,
4, and 4 1/2 ft. beds.
Weight, lathe and countershaft 375 lbs.

Multiple Spindle Drilling and Tapping Machines

Flat Turret Lathes

Double End Shaft Turning Lathes

Special Machinery

GREENLEE BROS. & CO., Rockford, Ill.

FLATHER LATHES

HIGHEST GRADE FOR TOOL-ROOM
AND MANUFACTURING PURPOSES

The Flather Company, Nashua, N. H.

STOP Throwing Away Hack,

HARD TEMPERED METAL CUTTING Band Saws

MILLING, SLITTING AND SCREW SLOTTING SAWS

SEND TO US
by mail two saws and
we will resharpen
them

FREE OF CHARGE
that you may see the
work our machines
do

REDUCE
PURCHASES

IT COSTS **5¢** To Sharpen
A Band or Circular

IT COSTS **2¢** To Sharpen
A Hack Saw

Write for Catalog

THE WARDWELL MFG. CO.

Makers of automatic machines for sharpening—Hack Saws, Hard
Tempered Band Saws, Milling, Slitting and Screw
Slotting Saws and all Woodworking Saws

111 Hamilton Ave.

Manufacturers of the largest line of Saw Filers made in U. S. A.

CLEVELAND, OHIO

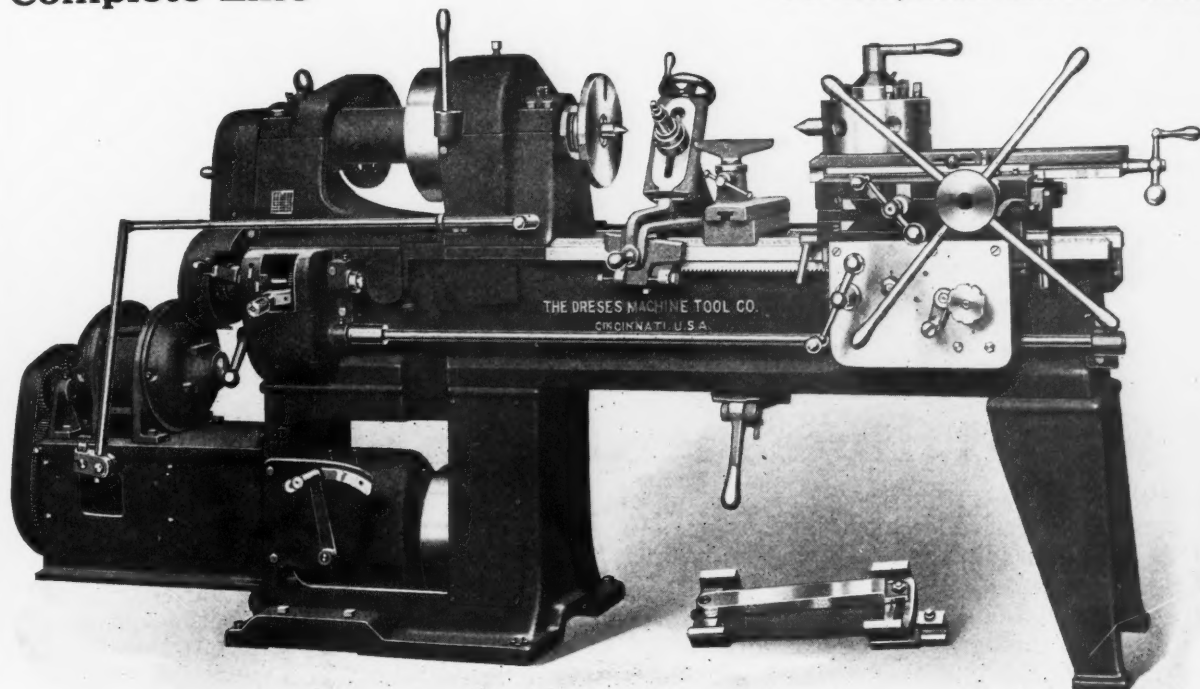
SAWS
with teeth up to
32 to 1"
can be salvaged
at a speed of
45 teeth a minute

SAVE
MONEY

TURRET MACHINERY

Complete Line

For Iron, Brass and Rod Work



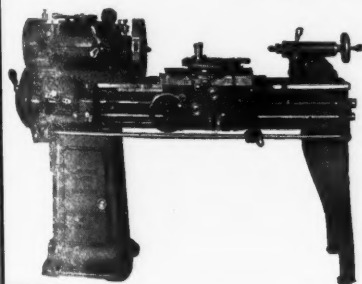
THE DRESES MACHINE TOOL CO., Cincinnati, Ohio

ROCKFORD "ECONOMY" LATHES

**Start
Right
in
Saving
Money**

*Let us
tell you more
about them.*

Small sized, compact lathes built to handle heavy work, and do it well and at a profit—such are Rockford "Economies." Smooth running, finely built, convenient and *fast*. 32 feeds—32 threads, and precision which makes them a valuable acquisition to any tool room. 12"-14"-16" swing.



**Rockford
Machine
Tool Co.**

**2400 Kishwaukee Rd.
Rockford, Illinois**

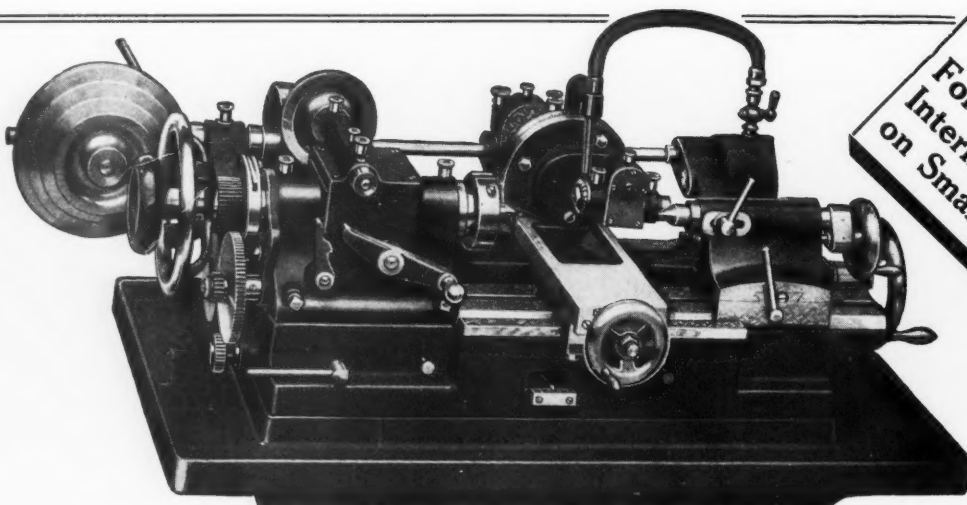
Built By Pioneers— 90% Efficient

The unusual efficiency of the 3-L Variable Speed Hydraulic Broaching Machine is due, in great measure, to the fact that it was developed and designed by a pioneer organization. Many years of steady, consistent improvement has evolved a machine combining the qualities of speed, wide cutting range and strength to such an extent that it increases production from 50% to 250% wherever installed. The 3-L Variable Speed Hydraulic Broaching Machine is a 90% efficient unit.



**THE J. N. LAPOINTE COMPANY
NEW LONDON, CONN.**

Domestic Representatives and Foreign Agents: 19 South La Salle St., Chicago, Ill.; 8821 Meridian Ave., Cleveland, Ohio; 1939 N. Meridian St., Indianapolis, Ind.; 31 Harper Ave., Detroit, Mich.; Charles Churchill & Co., Ltd., 9-15 Leonard St., Finsbury, London, E. C. 2, Birmingham, Manchester, Newcastle, Bristol, Leeds, Sheffield, England; Glasgow, Scotland; Rudel-Belnap Machinery Co., Ltd., Montreal and Toronto, Canada; Germany, Schuchardt & Schutte, Berlin; Austria, Schuchardt & Schutte, Vienna; Czecho-Slovakia, Schuchardt & Schutte, Prague; Hungary, Schuchardt & Schutte, Budapest; Sweden, Schuchardt & Schutte, Stockholm; Denmark and Norway, Schuchardt & Schutte, Copenhagen; Jugo Slavia, Schuchardt & Schutte, Agram; France, R. S. Stokvis & Fils, Paris; Belgium, R. S. Stokvis & Fils, Brussels; Holland, R. S. Stokvis & Zonen, Rotterdam.



Greater Thread Production at Less Cost

Waltham Thread Millers are easily set up and semi-automatic in action. Unskilled, low waged operators can achieve high production with them on accurately cut threads of either inch or metric pitch.

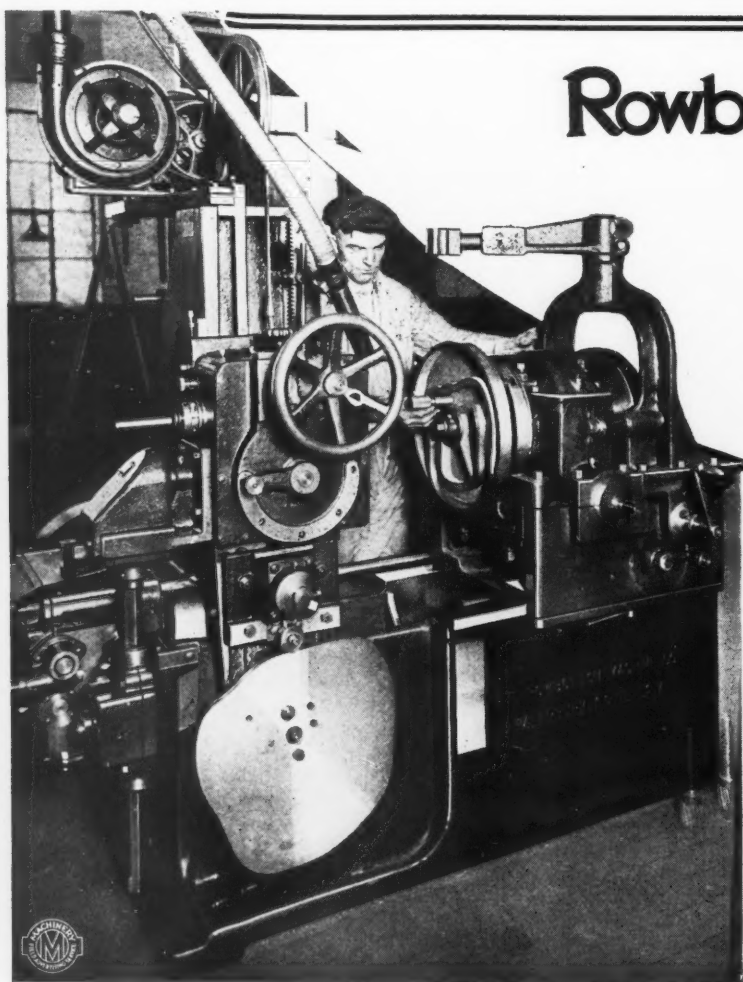
Features of the Waltham Thread Miller include a compensating bar, which varies length of thread to make allowances of changes in hardening, taper milling attachment, longitudinal adjustment for matching threads already cut and an index for cutting multiple threads.

Further Information Gladly Sent Upon Request

WALTHAM MACHINE WORKS, Newton Street, Waltham, Mass.

Makers of Small Thread Millers, Gear Cutters, and other Small Automatic Machines

Foreign Representatives: Buck & Hickman, Ltd., London, Fenwick Freres Co., Paris, Andrews & George Co., Tokyo, Japan, Andrews & George Co., Seoul, Korea, Andrews & George Co., Dairen, Manchuria.



Rowbottom for Cams

More Than a Slogan

"Rowbottom for Cams" is the rule with many engineers who design and build automatics.

Accurate Cams are essential to efficient automatic operation — economical production materially reduces manufacturing costs—Rowbottom production methods on Rowbottom Cam Milling Machines insure these important points.

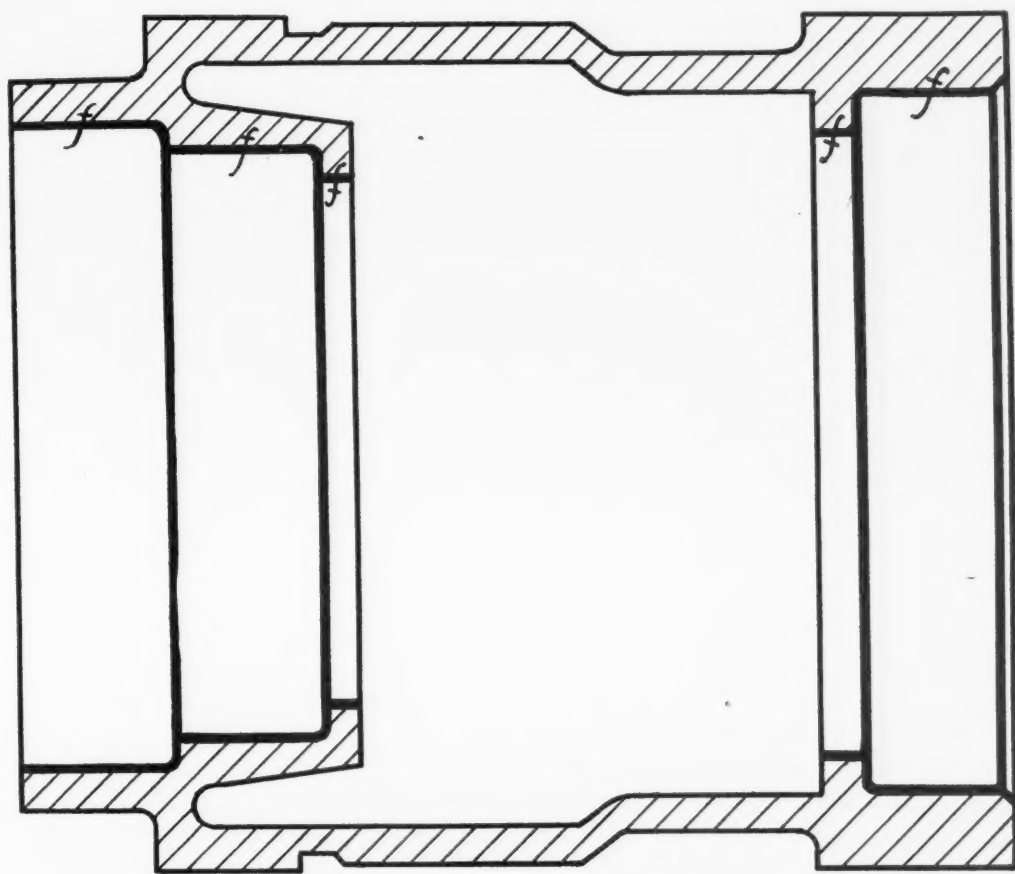
Get estimates on your cam needs from our contract shop; let us tell you about builders of automatics who find Rowbottom installations in their plants.

The Rowbottom Machine Co.

Factory: Waterville, Conn.
Waterbury, Conn., U.S.A.



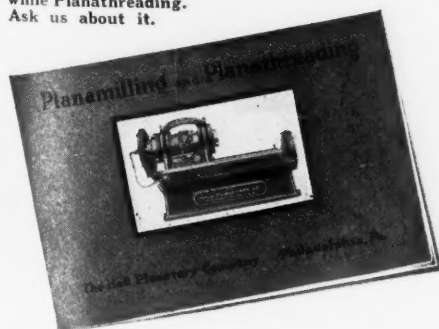
How Would You Machine This?



Could You Finish all Five Bores at One Time? —The Planetary Does



The Planetary Approach gives entering and finish threads without razor edge—while Planathreading. Ask us about it.



By any previous method it would be impossible to mill these five diameters perfectly concentric at one pass of the cutters. The Hall Planetary accomplishes this and even more complicated operations with extreme rapidity. The milling cutters move—carried by a massive arbor—the work remains stationary. Applied to form and thread milling the Hall Planetary method is called Planamilling and Planathreading.

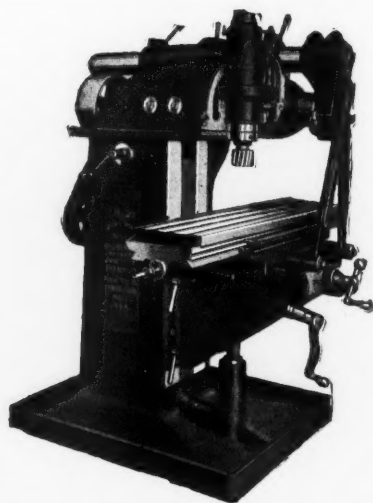
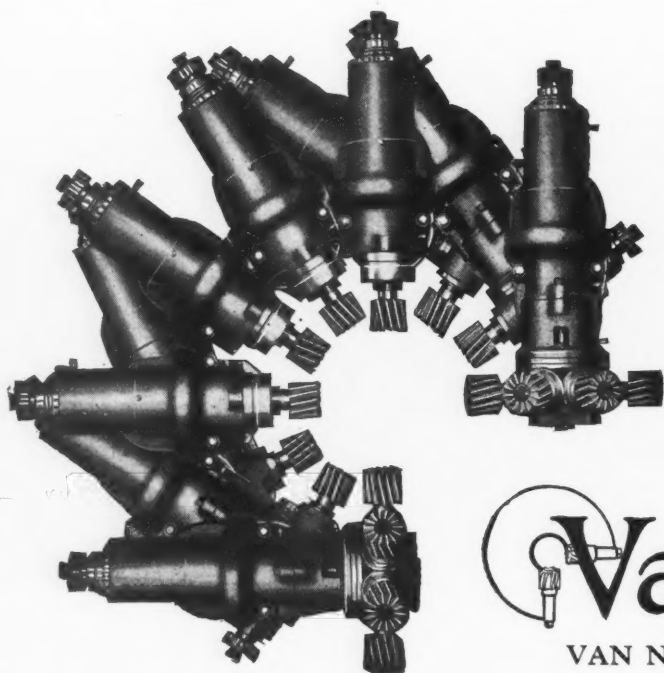
See the Hall Planetary Planathreading and Planamilling at the National Machine Tool Builders' Exposition—Cleveland, Ohio, September 19-23. Booth A11 Annex.

In the meantime send for the book and prepare yourself for an agreeable surprise!

THE HALL PLANETARY CO.

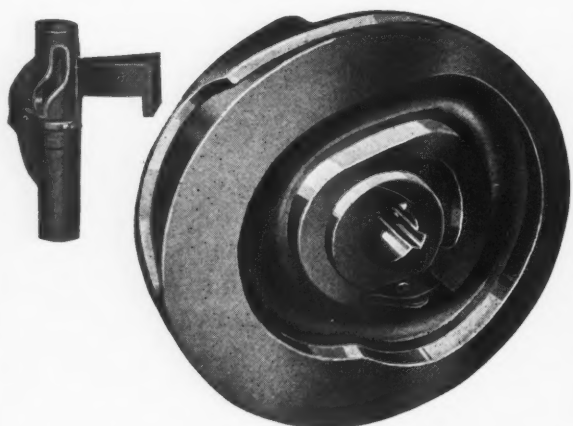
Fox St. and Abbotsford Ave.
Philadelphia, Pa.





VAN NORMAN MACHINE TOOL CO.
SPRINGFIELD, MASS., U. S. A.

The Pivotally Adjustable Main Cutter Head—Mounted on the Horizontally Slidable Ram—Makes the Van Norman "Duplex" the *Ideal Tool Room Milling Machine.*



CAMS

Cams that cover a wide variety in size and design are being built every day at Kent-Owens. Our unusual facilities and long experience command a prominent position in this field.

Regardless of the size or quantity—or the unusualness of your job—Kent-Owens is equipped to build cams for you.

Send us your blueprints—we will be glad to submit quotations.

The Kent-Owens Machine Company
958 Wall St., Toledo, Ohio

Cleveland Open Side Planers

In production the factor of certainty of performance is the only sure factor of safety. If you want both, investigate the merits of CLEVELAND OPEN SIDE PLANERS.

26" to 72"

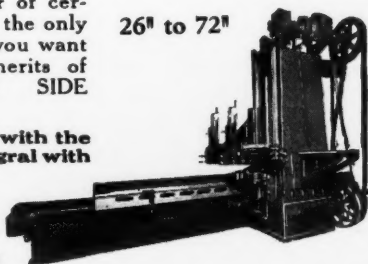
The Open Side Planer with the Column Base Cast Integral with its Closed Top Bed.

Over 1090 installations.

Send for descriptive circular

Dial Feed; Power Rapid Traverse; Single Turn Rail Clamp; Automatic Trip to Rail Raising Mechanism; Forced Feed Lubrication to Vees; Improved Head Clamp.

THE CLEVELAND PLANNER COMPANY
3148 Superior Ave. Established 1900 CLEVELAND, OHIO



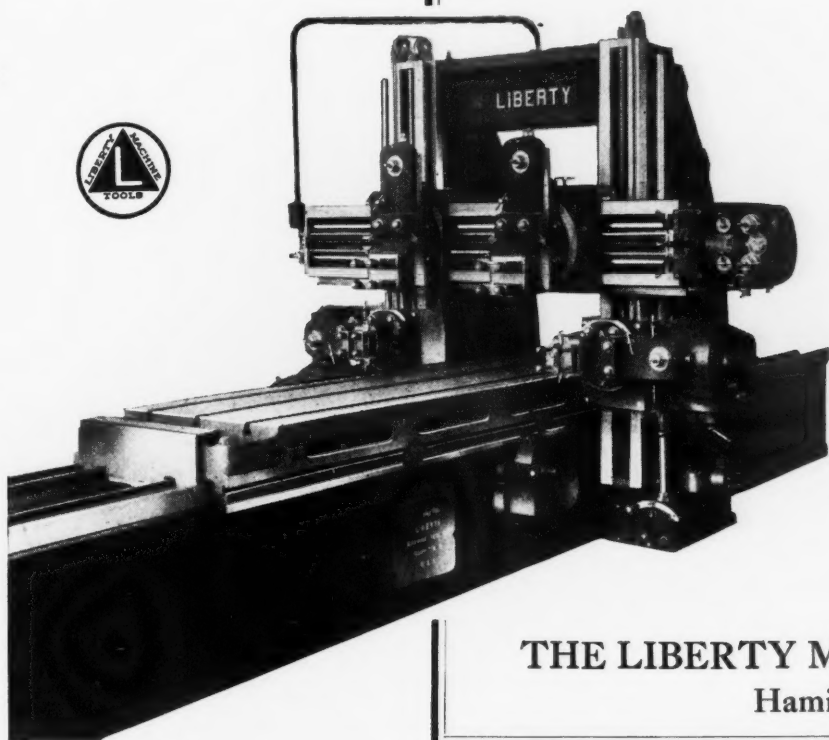
Automatic Threading Lathes, Automatic Hob Thread Millers, Coulters Multiple Spindle Profilers, Coulters Shaping Planers, Special Machine Tools.

If threading operations are important in your manufacturing processes, send for details of the entire line.

The Automatic Machine Co., Bridgeport, Conn.

Other Features

Improved Automatic Shifter—Method of clamping chopper box with angle clamp—steel gib full length of table to eliminate lifting table under heavy cuts; Lever for controlling feed at beginning and end of cut.



LIBERTY PLANERS

Profit-makers Everywhere

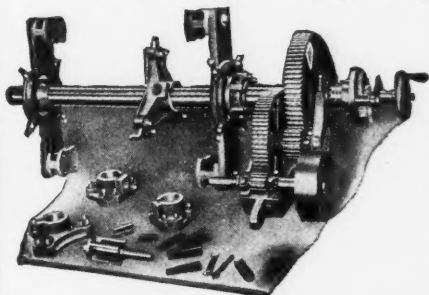
Liberty Planers are making good in all lines of industry—showing the way to new limits of accuracy on production work and in the tool room shaving costs, cutting time and simplifying all operations within their ranges.

Check over a few of the features with us and you will more readily appreciate why. The top of the planer is free from all shafting, gears and clutches. Rail and side head elevation accomplished with revolving nuts. Built-in motors for operating rail and side heads. Concentrated control. Massive, though simple, construction.

THE LIBERTY MACHINE TOOL CO.

Hamilton, Ohio

Underwood Portable Tools A Tool for Every Purpose



Portable
Boring Bars
Crank Pin Turn-
ing Machines
Pipe Benders
Rotary Planers
Milling Machines
Flue Cleaners
Special Machines

H. B. UNDERWOOD CORP., Philadelphia, Pa.
Established 1870

U. S. HAND MILLERS

For all classes of light milling

U. S. SENSITIVE DRILLERS

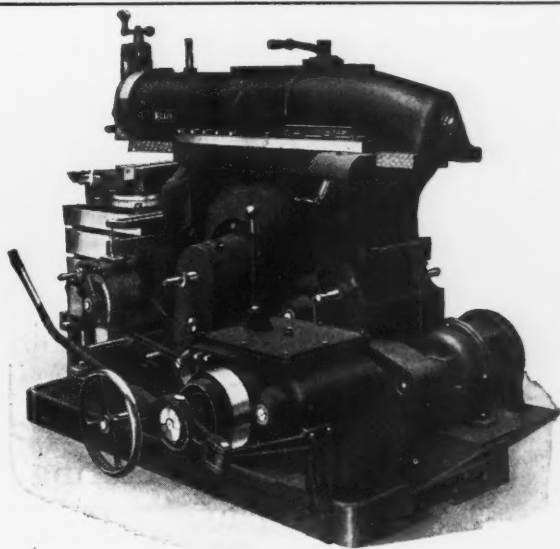
For all classes of light drilling
SEND FOR CIRCULARS AND PRICES

United States Machine Tool Co. CINCINNATI, OHIO

Shapers Exclusively

Crank Sizes: 12", 14", 16", 20", and 25"—Either Cone Driven or through Speed Box, 32" B. G.
All Geared Single Pulley Drive

THE SMITH & MILLS COMPANY
CINCINNATI OHIO, U. S. A.



Dependable Crank Shapers

Kelly Crank Shapers do consistently good work. They are easy to run, economical and have the stamina to stand the gaff of heavy production. They take heavy cuts without vibration or chatter—their precision is exceptional. The exclusive product of more than three decades of specialization, they possess features which make them stand alone—yet their price is surprisingly moderate.

"Crank Shapers" tells all about them—
let us mail you a copy.

The R. A. Kelly Company

XENIA

Makers of Crank Shapers only.

OHIO, U. S. A.



Takes the Grief Out of Curves and Angles

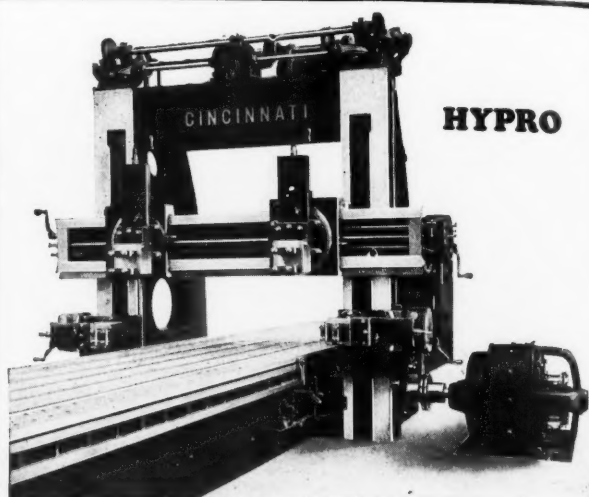
Adjustable to two minutes and accurate enough for the finest die work, the Rhodes Rotary Table machines segments of circles and angles without taking down the work.

This handy attachment will refund its purchase price many times over in the busy shop. Forty turns of the crank give one table revolution, and each turn can be minutely sub-divided. The table can be moved from machine to machine without resetting the work.

Write us to-day for further details.

The Rhodes Manufacturing Company

HARTFORD, CONNECTICUT



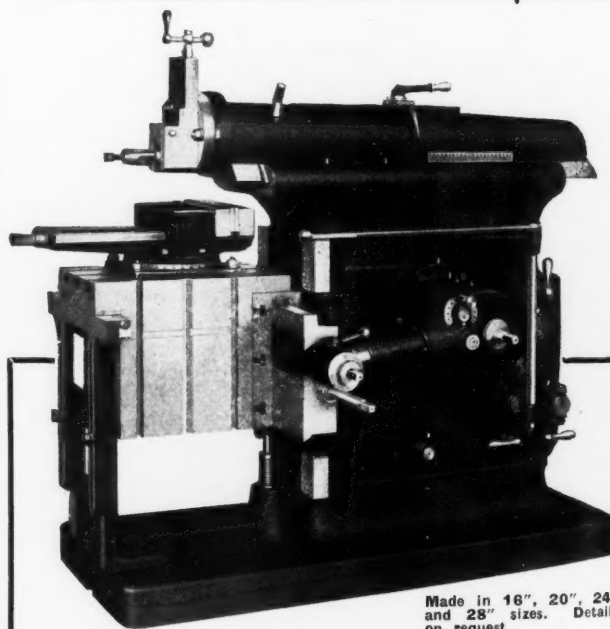
CINCINNATI HYPRO PLANERS

Although well within the price range of the average shop, Cincinnati Hypo Planers pay an unusually large return per dollar invested.

Ideally combining production and range with accuracy, they attain maximum results with minimum handling and power consumption.

Let us tell you all about the features and capabilities of these up-to-the-minute tools. Send for Catalog.

The Cincinnati Planer Co.
Cincinnati, Ohio



Rockford Crank Shapers

Well braced ram and table, ample lubrication and unusual care in every detail protect Rockford Crank Shapers from repairs and break-downs. Smooth running, fast and accurate—they keep well ahead of their daily allotment of work, and turn in unusually low costs on every job assigned to them.

Lathes, Shaper-Planers. Drilling Machines also. Let us send details of the line.

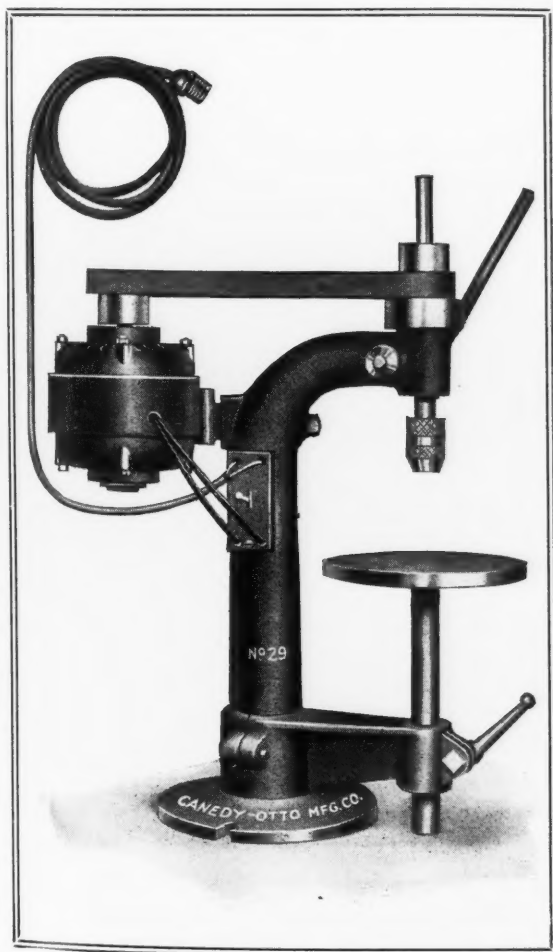
Rockford Machine Tool Co.
2400 Kishwaukee Road, Rockford, Illinois

C-O Drills are Quality Drills

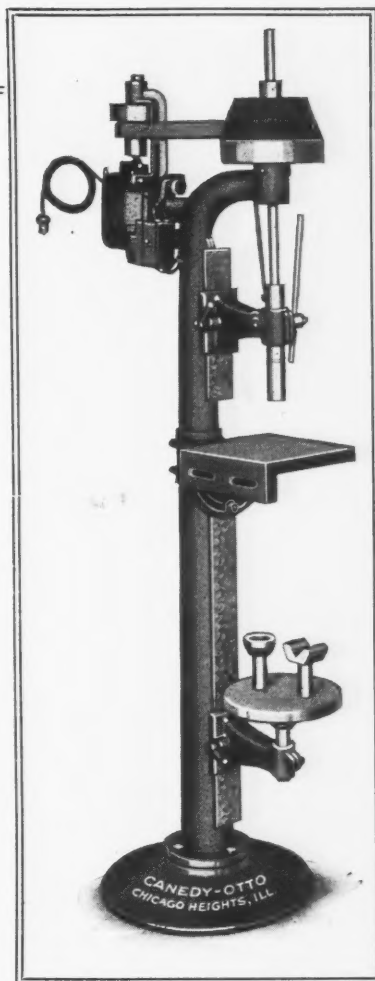
—priced within the range of all

C-O 14" SLIDING HEAD SENSITIVE DRILL

Here is a sturdy, accurate and productive drill with a range from 0 to $\frac{1}{2}$ "—the C-O 14" Sliding Head Sensitive Drill. Driven by a high grade motor of famous make, serviced everywhere, this versatile tool is always "ready for the job"—and always equal to it! Spindle is equipped with ball thrust bearing, and is well supported by sleeve with extra long bearing. Original attachment of motor eliminates idlers, pulleys and belts, cutting down friction and power consumption. Complete equipment, including lighting cord, toggle switch and $\frac{1}{2}$ " endless belt. A real profit-maker at a price that means a worth-while saving.



Complete description and prices of this and the C-O No. 14 model may be had upon request



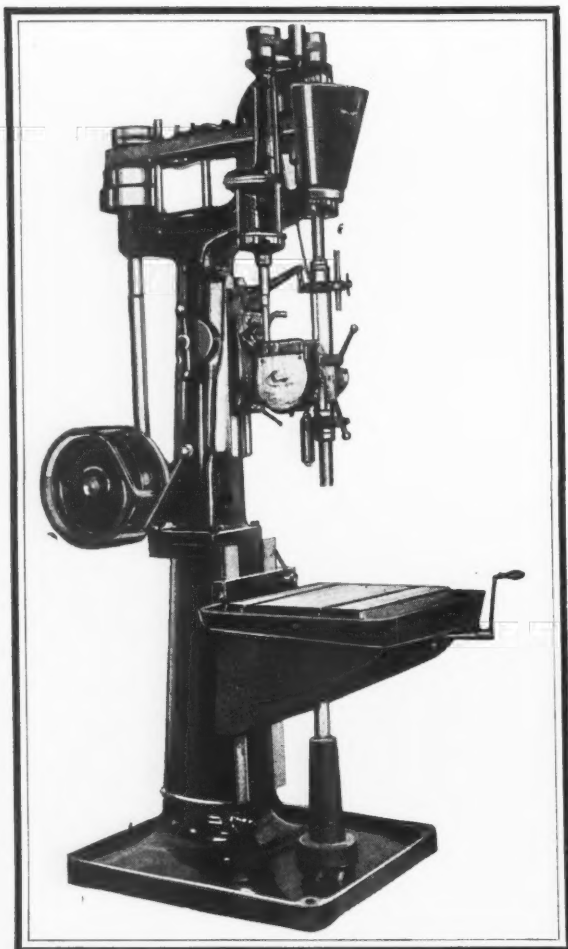
C-O SENSITIVE BENCH DRILL No. 29 (Motor Driven)

The ingenuity of this machine's design has eliminated the use of gears and an entire absence of noise and vibration features operations even at highest speeds.

The machine is furnished complete with a $\frac{1}{4}$ H. P. vertical type ball-bearing motor so attached that it can be slid in or out to obtain proper tension on the belt. Other equipment features include a toggle type switch, extension cord and socket, belting and chuck.

The cone pulley is always in exact alignment, enabling the belt to be run at maximum speed without twisting and turning. This feature results in a considerable saving in time and in belt expense, and gives a greater speed of spindle. Capacity of drill, 0 to $\frac{3}{8}$ ".

CANEDY-OTTO MANUFACTURING COMPANY
CHICAGO HEIGHTS, ILL.



Edlund Drilling Machines

Keep Drilling Costs Down

The entries on the Maintenance Record Cards for Edlund Drilling Machines are few and far between. Even in the grind of intensive production they run along smoothly, steadily, day after day with a reserve of power and endurance which keeps them going when pushed to the limit.

One of the newest is the Edlund 24" Ball Bearing Production Machine—easy to run as a sensitive—accurate as production requirements demand. Built as finely as years of experience, the most modern engineering and the best of materials can make it. Drive is simple and direct to spindle through a pair of hardened alloy steel bevel gears, a short straight belt, and a four spline broached sleeve.

Nine ball bearings to each single spindle machine. Power feed of tooth — clutch type, three feeds: 0.008", 0.011", 0.015" per spindle revolution.

Made in 1 to 4 spindle types with and without power feed. All details on request.

EDLUND MACHINERY CO., Inc.
CORTLAND, NEW YORK

HOLES BY EDLUND

Are Low Cost Holes

BURKE

Cut Production Costs With This Low-Priced Drill

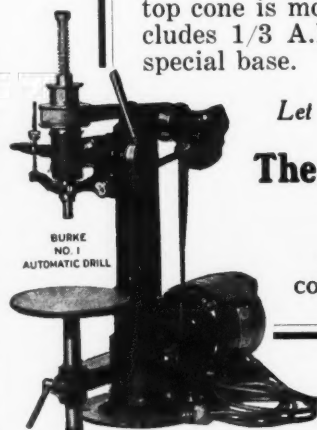
The No. 1 Automatic Production Drill, driven singly or in gangs, will increase output and lower production cost per piece wherever installed. It is *really* automatic, allowing operator full use of both hands, and drills with high sensitivity on any job within its capacity of $\frac{3}{8}$ inch.

Counterbalanced tapered spindle runs through large bearing on which top cone is mounted. Equipment includes $\frac{1}{3}$ A.P. motor mounted on special base.

Let us send you the details.

**The Burke Machine
Tool Co.**

516 Sandusky Street
CONNEAUT, OHIO, U.S.A.

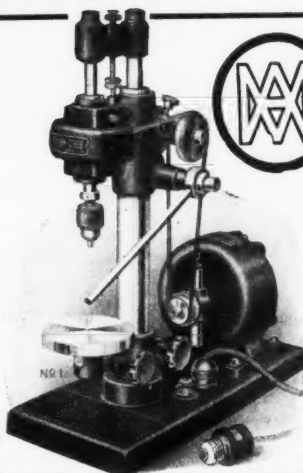


The Users Tell the Story

A. M. Sensitive Drilling Machines handle the precision drilling up to $\frac{3}{16}$ " in many of the country's leading plants. Most of these organizations have reordered A. M. Sensitive Drilling Machines time and again. Here are a few examples:

Wadsworth Watch Case Co., Dayton, O., 25 repeat orders.
L. G. Balfour Co., Attleboro, Mass., 9 repeat orders.
Barber-Colman Co., Rockford, Ill., 8 repeat orders.
—and many others.

Get our Booklet C
Adolph Muehlmann
S. E. Cor. Fifth and Elm Sts.
CINCINNATI, OHIO, U.S.A.



HOEFER Auxiliary Head

Makes your single spindle drilling machine yield multi-spindle profits.

Branches in Principal Cities
HOEFER MFG. CO.
FREEPORT, ILL.

LAPOINTE BROACHING MACHINES LAPOINTE BROACHES

Use them to secure maximum broaching efficiency. Our engineers will help on special problems. Estimates gladly furnished.

THE LAPOINTE MACHINE TOOL COMPANY, Hudson, Mass., U.S.A.

Avey

Drilling Machines with Aveymatic Power Feed

The Aveymatic is an improved power feed mechanism built into three sizes of Avey Ball Bearing Sensitive Drilling Machines. By its use less attention is demanded of the operator, hourly output is increased, and better work done.

The spindle feeds with great accuracy to any predetermined depth, trips positively and returns—but at any time during the stroke, may be advanced or arrested by manipulation of the hand feed lever, and without disengaging feed. Thus, although operating automatically, the drill can be advanced or withdrawn just as if hand fed.

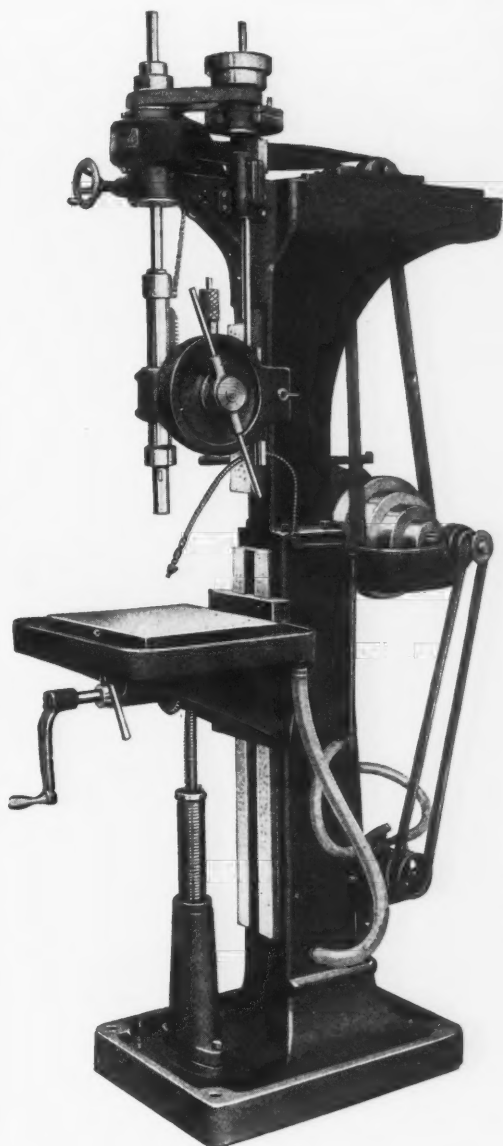
The downward feed and return of the spindle may be made continuous or intermittent as desired—making the machine full or semi-automatic. This is simply accomplished by turning a small lever through 180°. The operator has only to feed the work.

Let us send you some figures showing production increases made by Aveymatic Drilling Machines in actual practice.

Aveymatic

Means More Than Automatic

THE AVEY DRILLING MACHINE CO., Inc.
CINCINNATI, OHIO



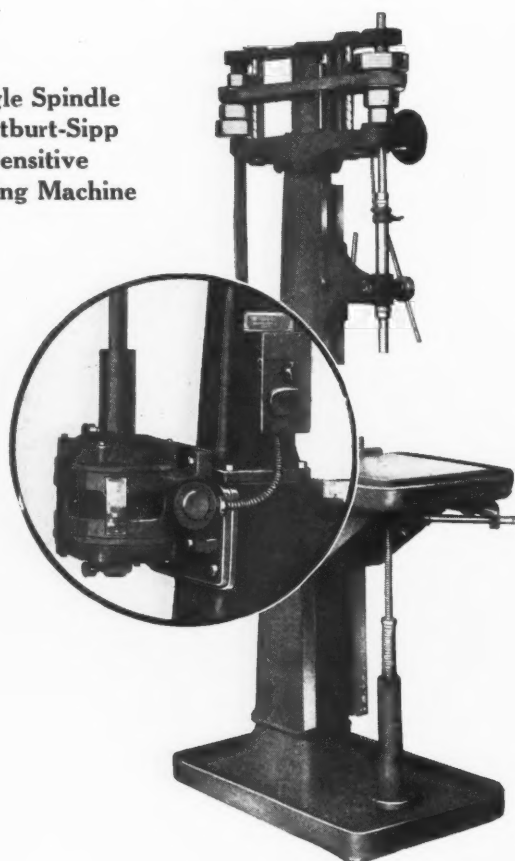
Avey Products

- Avey Drilling Machines—5 sizes.
- Avey-matic Drilling Machines—3 sizes.
- Avey Built-in Tapping Units—2 Styles.
- Avey Tapping Attachments—plain—5 sizes.
- Avey Tapping Attachments—back geared—3 sizes.
- Individual Drilling Spindles—2 Styles.
- Avey Millband Cutting-off Machine.
- Avey Pulley Lathes.



FOOTBURT

**Single Spindle
Footburt-Sipp
Sensitive
Drilling Machine**



A Lower Priced Motor Drive

Single Spindle FOOTBURT Sipp of this type, fully equipped with motor, are lower in price than a standard belt driven machine with horizontal motor attached. This represents a worth-while saving that should be of interest to you.

This simplified motor drive furnishes the usual four spindle speeds with a standard constant speed vertical motor.

Such FOOTBURT-SIPP features as the quick speed change and automatic idler pulleys are retained.

Write for full details and prices.

The Foote-Burt Company

CLEVELAND, OHIO

Detroit Office—4-151 General Motors Bldg.

FOOTBURT

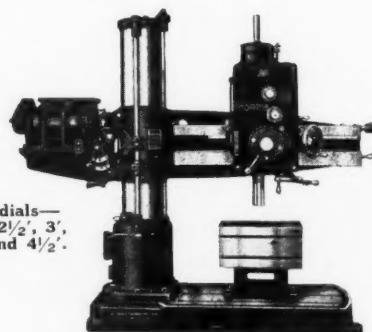
A Simpler, Better Radial Drill

— With Motor Mounted in Arm

Morris engineers have evolved a new type of radial drill, so simple in design that four bevel gears, three spur gears and their usual shafts and bearings have been eliminated in its construction. Fewer parts—fewer replacements—less wear.

By mounting the motor in the 4' arm they have achieved a more direct drive that is practically vibrationless and unusually economical.

This new Morris comes with either variable or constant speed motor. There are four tap leads in the head, 8-11-½, 14-18 threads. Send for full description.



Morris Radials—
Sizes: 2', 2½', 3',
3½', 4', and 4½'.

The Morris Machine Tool Co.

CINCINNATI, OHIO, U. S. A.

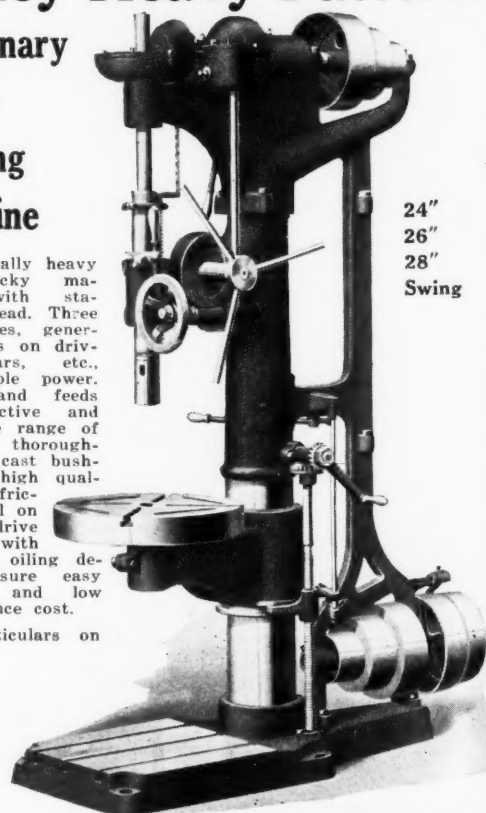
Sibley Heavy Pattern

**Stationary
Head
Drilling
Machine**

An unusually heavy and stocky machine with stationary head. Three step cones, generous ratios on driving gears, etc., give ample power. Speeds and feeds are selective and cover the range of machine thoroughly. Die cast bushings of high quality anti-friction metal on main drive bearings with improved oiling devices insure easy running and low maintenance cost.

Full particulars on request.

*Write
for
Catalog*



24"
26"
28"
Swing

SIBLEY MACHINE COMPANY

8 Tutt Street

SOUTH BEND, IND., U. S. A.

Can You Compete With Production Like This?



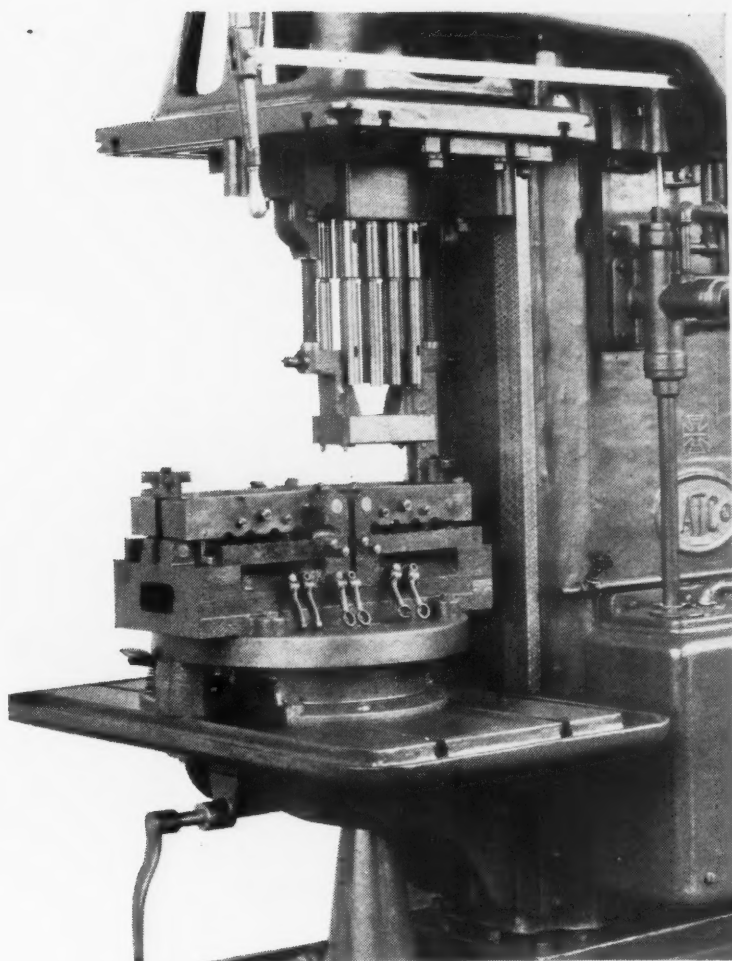
C13 HYDRAULIC

Drilling
600 Pieces
Per Hour

21/64 Hole
1" Thru
Steel Forging

Eight pieces are loaded in each side of the two position fixture, the operator loading one side while the machine is drilling eight, giving

*Continuous
Production*



Unretouched Photo of C13 Hydraulic with Rotary Table, Fixture, and Cluster Box.

Have you kept in touch with the late improvements made in drilling and tapping equipment? The greatest advances in the development of production drilling and tapping machines have been made in the past few months.

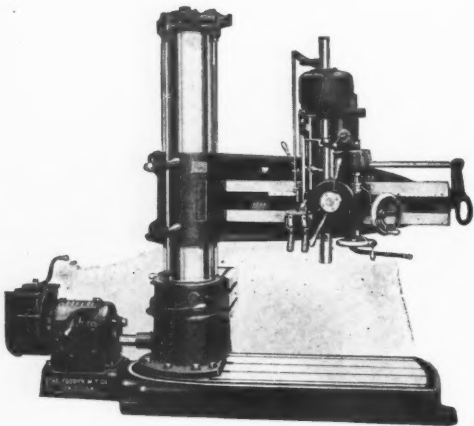
NATCO Engineers are specialists in "hole" equipment and are in position to give you a proposition covering any need you may have.

Obsolete drilling and tapping methods have no place in modern manufacturing methods. Stop the leaks thru holes made by out of date machines with efficient **NATCO** equipment.

Mail us your blue prints for a proposition. We'll show you "how" without obligation.

THE NATIONAL AUTOMATIC TOOL CO.
RICHMOND, INDIANA

In the Matter of Drilling Production



Radials—All geared, High Speed to Heavy Duty. 2 to 6 ft., capacity 3/16" to 4" drills. Balanced Arm, motor driven, 4 to 6 ft. High Speed Sensitive, 3, 3 1/2 and 4 ft. for drilling and tapping, capacity to 1".

Uprights—21" to 30". Capacity 3/16" to 3".

Ball Bearing Sensitive—13" to 24", 1 to 6 spindles, capacity to 1 1/4".

Send for complete details.

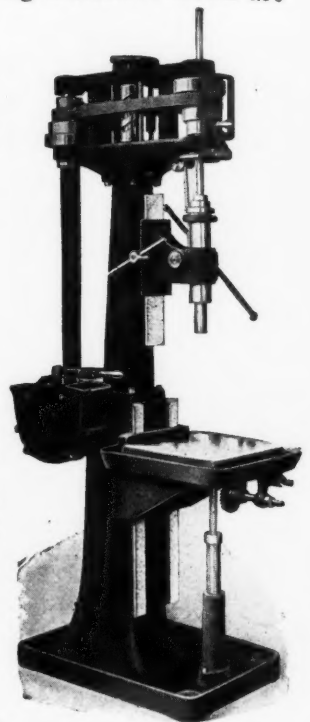
In the matter of Drilling Production users say that Fosdick Drilling Machines give a little more, and cost a little less than average drilling equipment.

Fosdick Radials, Uprights, Ball Bearing Sensitive Drills are made in sizes and styles to meet every drilling requirement; they do the work—whether it is drilling holes in a heavy job, or a precision drilling operation in a delicate part—to your complete satisfaction on production and costs.



AGENTS:

Colcord-Wright Machinery & Supply Co., St. Louis, Mo.
Barbour, Love & Woodward, New York, N. Y. E. A.
Kinsey Co., Cincinnati, Ohio, Indianapolis, Ind. Penin-
sular Machinery Co., Detroit, Mich. Homer, Strong Co.,
Rochester, N. Y. Buffalo, N. Y. H. A. Smith Machinery
Co., Syracuse, N. Y. Swind Machinery Co., Philadelphia,
Pa. Somers, Fittler & Todd Co., Pittsburgh, Pa. Stocker-
Rumely-Wachs Co., Chicago, Ill. Milwaukee, Wis. Brown-
ell Mch. Co., Providence, R. I. The Mine & Smelter Supply
Co., Salt Lake City, Utah. Moore-Handley Hardware Co.,
Birmingham, Ala. C. F. Bulotti Mch. Co., San Fran-
cisco, Cal. Eccles & Davies, Los Angeles, Cal. Bay Verte
Machinery Supply Co., Green Bay, Wis. M. A. Wertman
Mch. Co., Cleveland, O. Burton, Griffiths & Co., Lon-
don, England. Fenwick Freres Co., Paris, France. Wyn-
malen & Hausman, Rotterdam, Holland. Rylander &
Asplund, Stockholm, Sweden. With. Sonesson & Co.,
Malmo, Sweden, Copenhagen, Denmark.



THE FOSDICK MACHINE TOOL CO.

CINCINNATI, OHIO, U. S. A.

More Than Accuracy

Drill press precision means more than accurate drilling; it insures machine durability and less wear, less regrinding for the drills.

The Sigourney No. 0 Ball Bearing Bench Drill with speeds to 10,000 R.P.M. is designed and built to get maximum production on holes to 3/16" with minimum wear on the drills.



*Send for details of
Sigourney
Ball and
Plain Bear-
ing Drilling
Machines*

The Sigourney Tool Company

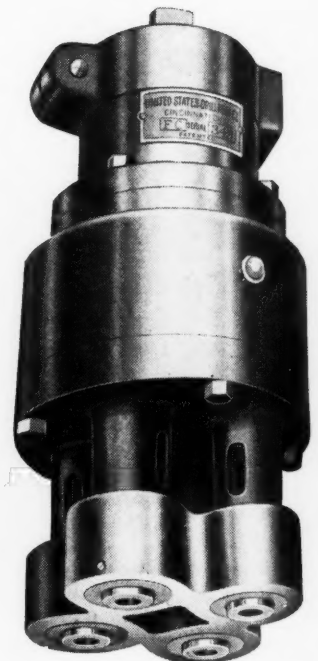
11 Sigourney Street

HARTFORD, CONN.

U.S. Multiple Drill Head

With this simple attachment on your one-hole-at-a-time drilling machine you can drill two, six or a dozen holes in the time it takes to drill one, and at a fraction of the cost of a multiple spindle drill press.

Send blueprints or sketches for our estimate of the savings possible on your work.



United States Drill Head Co.

1948 W. Sixth Street, CINCINNATI, OHIO

Michigan Agents—National Sales Engrg. Corp., Detroit

CARLTON RADIALS

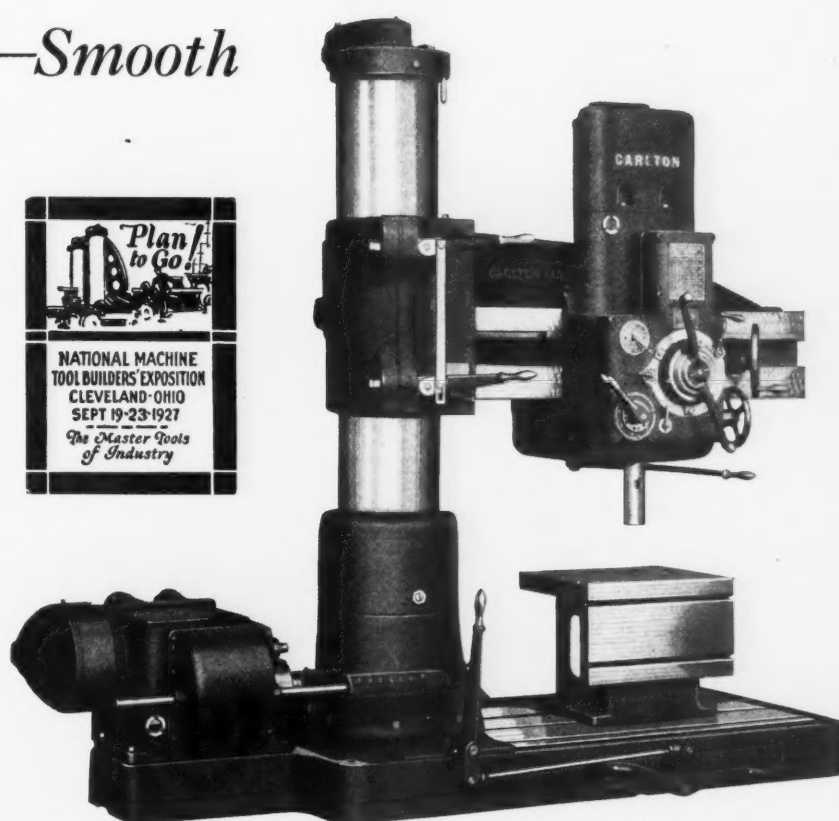
*Correct Balance—Smooth
Steady Service*

Designed and built to do profitable drilling in the modern shop. Ball bearings and running parts are enclosed in dust-proof units and operate in a bath of oil; easy operation and convenient control make Carlton Radials profitable producers on a wide range of work.

We are proud of Carlton service records—we'd like to tell you about the machines and some typical installations.

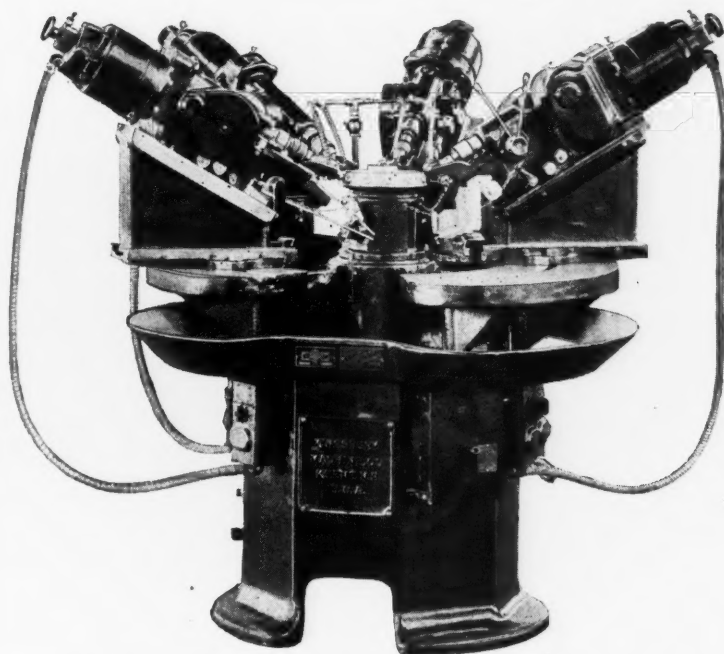
**THE CARLTON
MACHINE TOOL
COMPANY**

Cincinnati, Ohio, U. S. A.



Go to "KINGSBURY"—

when you want lowest production costs on small hole
drilling and tapping



Kingsbury Automatic Sensitive Drilling and Tapping Machines are made up of standard units assembled to produce a machine to best meet your drilling and tapping problems with reference to speed and convenience in handling the work and speed in completing the machine operations.

The machine illustrated has the heads mounted on a 30° angle to obtain advantages of inserting and retaining the work in nests, ejecting it, and getting rid of chips. This is a high speed automatic dial feed machine which in competition with multi-spindle automatic chucking machines offers greater production with a much lower investment. This particular type of machine can be furnished with as many as seven heads mounted horizontally, vertically or at an angle to take care of a large variety of progressive drilling and analogous operations.

Let us show you what we can do on your work under $\frac{3}{8}$ " drill capacity. Simply send prints or samples and give production requirements.

KINGSBURY MACHINE COMPANY, Keene, N. H.

Watch this Space!



For Latest Developments in the "HOLE HOG" Line
MULTIPLE SPINDLE DRILLERS, BORERS, COUNTERBORERS
LAPPERS, TAPPERS, DUPLEXES

Designed and Built by

MOLINE TOOL CO.,

Moline, Ill.

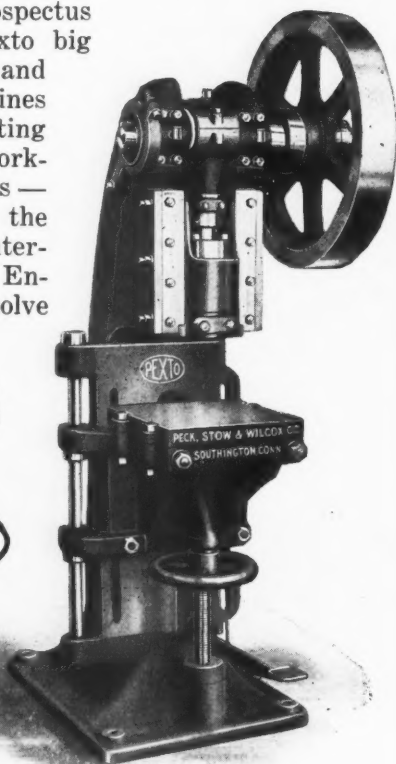
What Is Your Problem?

Write for prospectus listing the Pexto big line of Hand and Power Machines for facilitating sheet metal working operations—Then check the Bulletins of interest. Let our Engineers help solve that problem.

PUNCHING
WIRING and
SEAMING
PRESSES

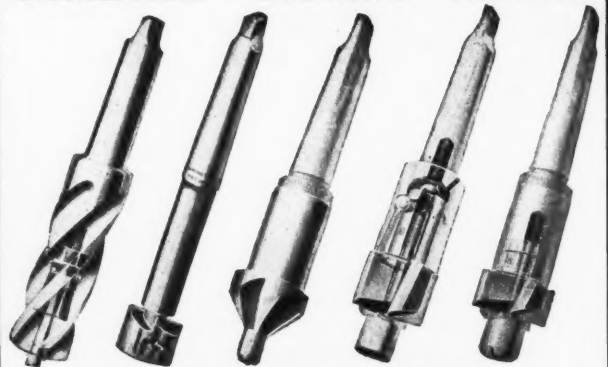


DIES
a
Specialty



THE PECK, STOW & WILCOX CO.
SOUTHINGTON, CONN., U. S. A.

COUNTERBORES SPOTFACERS CORE DRILLS



THE GAIRING TOOL CO.

DETROIT

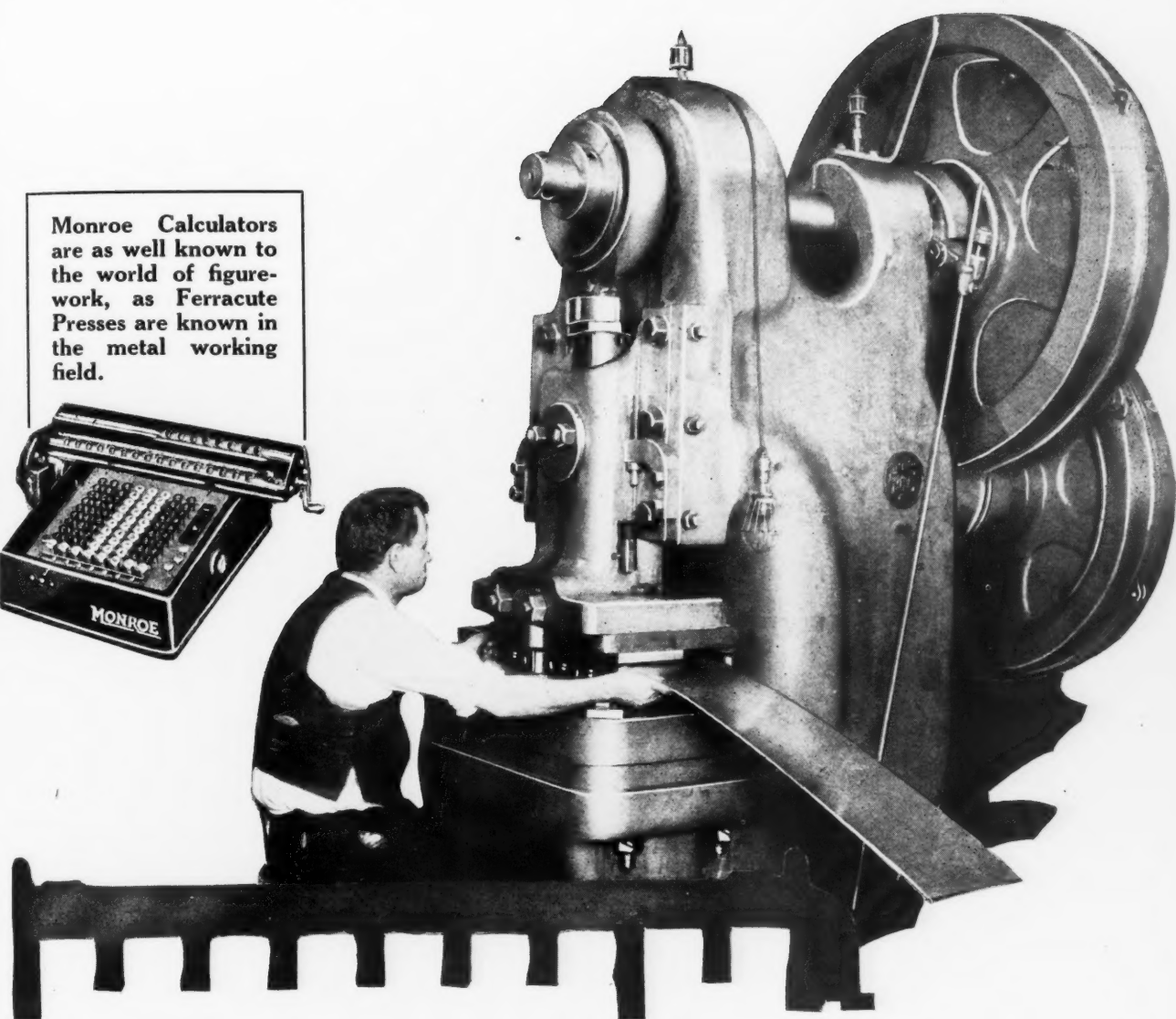
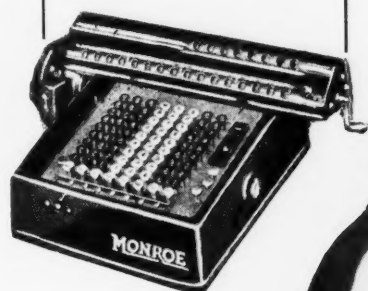
MICHIGAN

Buhr PATENT Multiple Drill Head
Readily converts any single spindle type drill press into a multiple drill. Spur geared, ball bearing and fully adjustable. Increases production. Get facts and figures.
The Buhr Machine Tool Co.
839 Greene St., Ann Arbor, Mich.

BROACHING DIFFICULTIES
are profitably solved by equipping with American Broaching Machines and Tools. Ask our engineers.

American Broach & Machine Co.
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Builders of All Types of Broaching Machines and Broaching Tools

Monroe Calculators are as well known to the world of figure-work, as Ferracute Presses are known in the metal working field.



On a delicate blanking operation

By no means does the extra-massive construction of the New Ferracute Press hinder its remarkable production speed.

In the plant of the Monroe Calculating Machine Co., Inc., Orange, N. J., the unit shown above is blanking aluminum side parts which form a part of the Monroe High Speed Adding Calculator.

The size of the piece being worked measures $8\frac{1}{2}$ in. long, $1\frac{3}{8}$ in. wide and .062 in. thick. Surely, this Ferracute Pres-

sure is aiding the manufacturer of Monroe Calculators. A cost level is maintained which permits the sale of a moderately-priced product.

A minimum of 50,000 blanks are finished between each regrind of the dies.

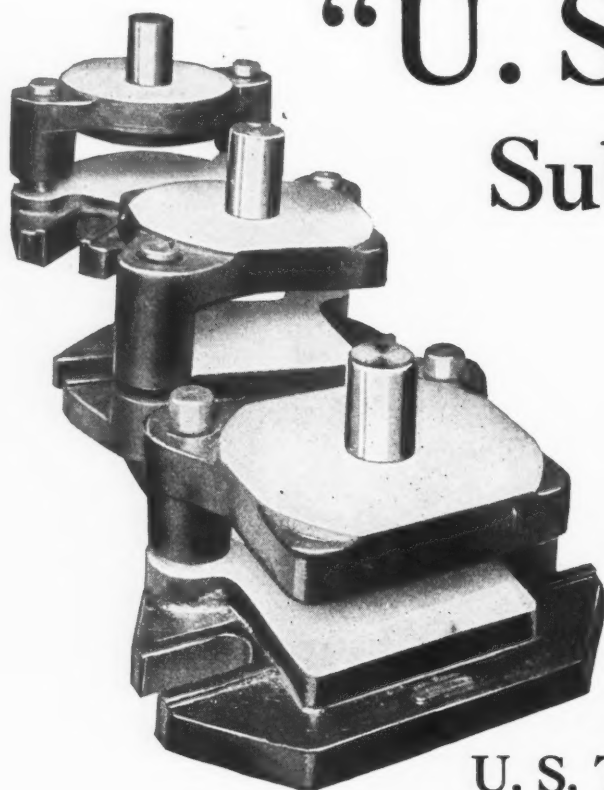
Our line of presses is as complete as our experience in handling press problems is wide. *Send for further details.*

Ferracute Machine Company
Bridgeton, New Jersey

Another

FERRACUTE PRESS

Saving money for its owner—in actual production



“U. S. TOOL”

Sub Presses

Made by better methods to more rigid standards than ever before, U. S. Tool Sub-Presses and Die Sets are a better product—at lower prices.

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U. S. TOOL COMPANY

Ampere, N. J.



FEDERAL PRESSES

Save Dies and Reduce Costs

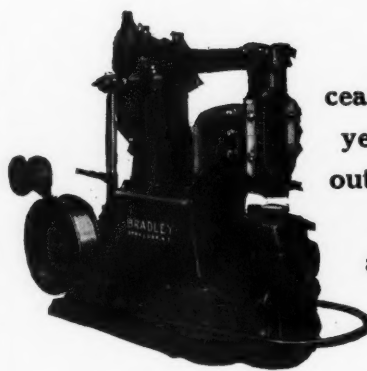
Long life for dies and a high degree of efficiency are assured by the sound design and sterling construction of Federal Inclinable Open Back Presses. Send for circular.



Federal
Press
Company
Elkhart,
Indiana

*Provided
with motor
bracket
when
desired.*

LONG HOURS



of
ceaseless pounding
year in and year
out never destroys
the perfect
alignment of

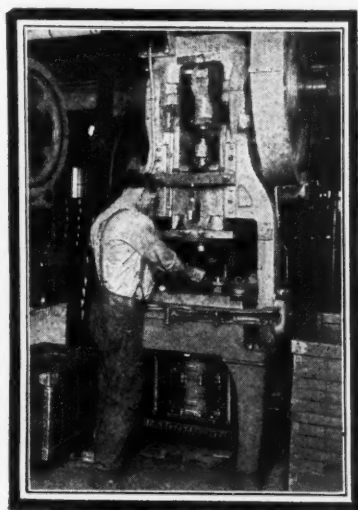
**THE BRADLEY
UPRIGHT HELVE
HAMMER**

Let us send you our catalog

C. C. BRADLEY & SON, Inc.
432 N. Franklin St. SYRACUSE, N. Y.

small stampings

*in small lots
done at a profit*



IN making their various products, the Hall Lamp Co., Detroit, uses many small pressed metal parts.

Their problem *was* two fold:—(1) how to get strong, smooth, *perfect* shells on an old arch type press, No. 30½ Bliss; and (2) how to produce them so economically that the price of the finished product could be low when sold at a profit.

Installation of Marquette Air Cushions solved both problems (1) by furnishing firm even pressure to the full extent of the draw so that wrinkles were eliminated; (2) by eliminating loss through spoilage and by making it possible to change over from one job to another *rapidly*, saving much time in the shop on short runs.

Installation of Pneumatic Die Cushions—Air Cushions—has been the inexpensive solution of most metal stamping troubles.

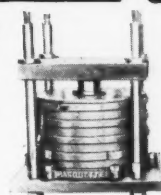
We solicit an opportunity to make suggestions in *your* case. Just send blue print or sample of the part with description of equipment used.

Marquette

TOOL & MFG. CO

1904 No. Kilbourne Ave.

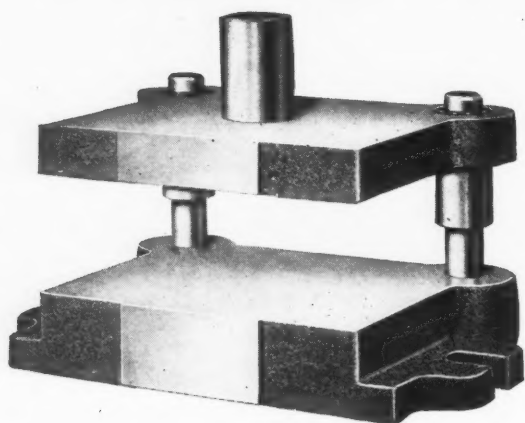
Chicago, Illinois



—“the writing on the wall”

And nearly 4000 makers of stampings have acted

Use **DANLY** DANLY Die Sets



There are 12 types and 97 sizes of Danly Die Sets—for every size of stamping. All parts interchangeable and standardized. Ask for the facts.

Stampings are being used more and more in the effort to speed production, lessen weight, eliminate operations, simplify design and production.

Lower stamping costs always follow the adoption of Danly Die Sets and accessories. Nearly 4000 makers of stampings use them, with their 50% saving in first cost—very much bigger savings in use—and convenience.

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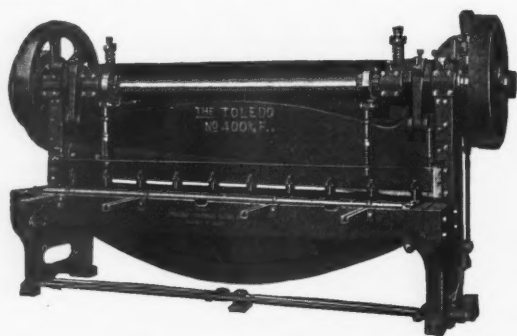
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THE “TOLEDO” PRESSES FOR EVERY PURPOSE!

The “Toledo” Shears

Easy to run, fast and remarkably accurate. Economical and noted for their ability to stand the strains of hard service. 100 sizes.



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Engineers, Founders and Machinists on
Equipment for Sheet Metal Products

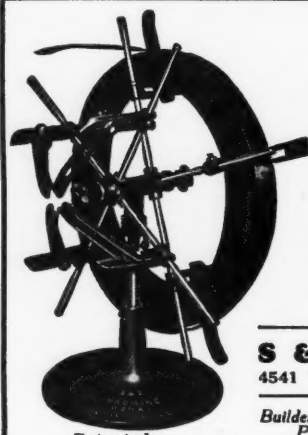
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FOR WORKING PLATES, BARS AND
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The Long & Allstatter Company

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S & S

Quick Loading Reels

Increase production
of your punch presses.

There is a reel for
every kind and size
of stock.

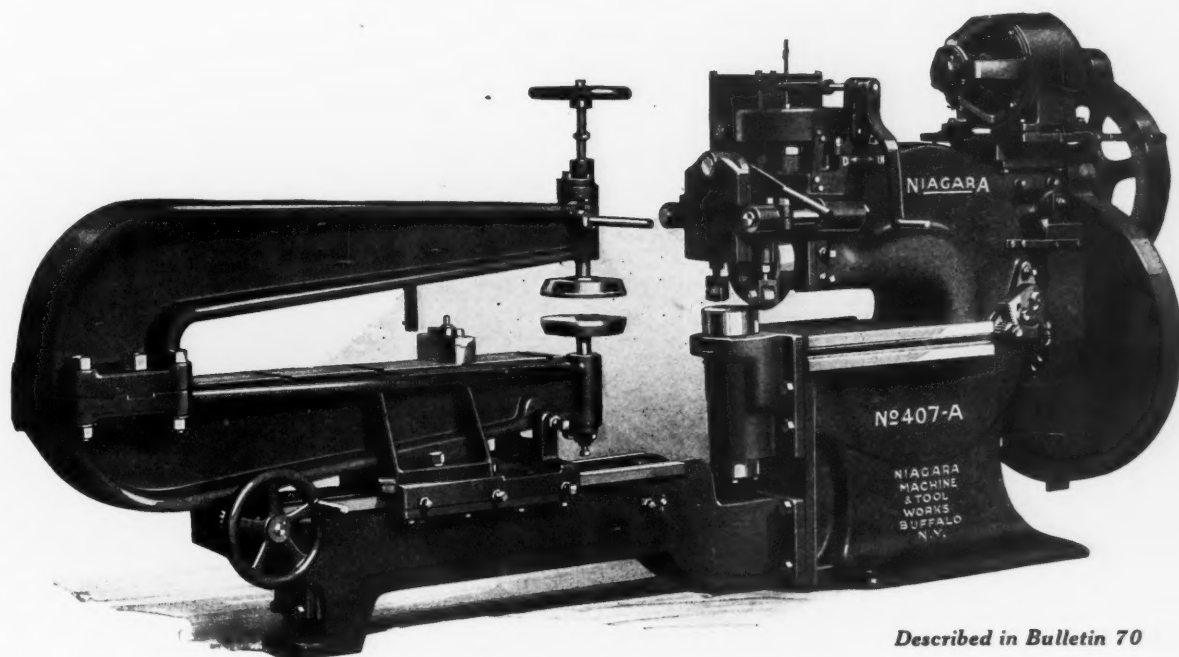
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S & S Machine Works
4541 W. Lake Street, CHICAGO, ILL.

Builders of Precision Automatic Feeds for Punch
Presses and Metal Working Machinery.

Exclusively Since 1879

SHEET METAL WORKING MACHINES, TOOLS, DIES—



Described in Bulletin 70

For
**Circling and Flanging
Sheet Metal Discs**



Both circling and flanging operations, for large diameters of $\frac{1}{4}$ inch metal or less, are efficiently taken care of by the combined Niagara Shear and Flanging Machine. If interested in flanging alone, there are Niagara machines to handle up to $\frac{3}{8}$ in. metal.

What have you to work from sheet metal? Write us and we will recommend the correct and economical machine or machines.

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Workman's Compensation

A very good thing as far as it goes—but protection against accident is better.

A D & M Junior Press Guard insures the safety of the power press operator under all conditions. Simple, strong, easily attached; automatic and positive in action, right to left or left to right swing as desired, used on any size, make and type of press.

30 days' free trial—in writing for details give complete data on work and machine and state which swing is desired.

TAYLOR-SHANTZ CO., 485 St. Paul Street
ROCHESTER, N. Y.



Atlas Arbor Presses

Useful Everywhere

Wide working range makes Atlas Arbor Presses useful equipment in the machine shop, auto plant, garage, etc.; power, speed and convenience insure profitable results on quantity production in manufacturing.

Atlas Patented Leverage Device enables the operator to exert maximum pressure continuously with normal effort; sturdy construction insures long and efficient service with low operating and upkeep costs.

Sizes with capacity to 50 tons pressure; centering capacity to 38". Send for catalog and prices.



Arbor
Press
No. 3

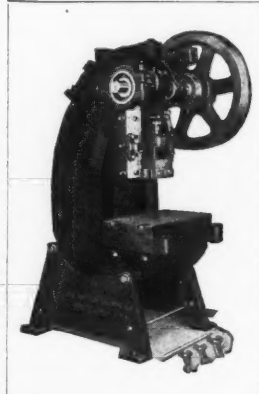
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KALAMAZOO, MICH., U. S. A.

MINSTER Power Presses

Complete line of
Inclinable, Horning,
Punching, and
Straight Side
Power Presses

The
Minster Machine Co.
Minster, Ohio



PRESSES—Foot and Power.
WIRE FORMING MACHINES—Standard and Special.
TUMBLING BARRELS—All kinds.
BALL BURNISHING EQUIPMENT.
AUTOMATIC CHUCKING MACHINES.

THE BAIRD MACHINE CO.
BRIDGEPORT, CONN.

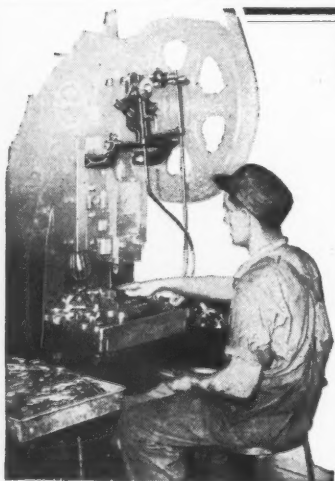


Turn Your Hand Fed Presses
Into
Automatic Machines

No. 5 Rack and Pinion Roll Feed
By Using Our
ROLL, DIAL AND MAGAZINE FEEDS

Daily Production Per Nine Hours, 40,000 to 60,000

F. J. LITTELL MACHINE CO., 4125-27 Ravenswood Ave., Chicago, Ill.
WATCH FOR OUR NEW CATALOG



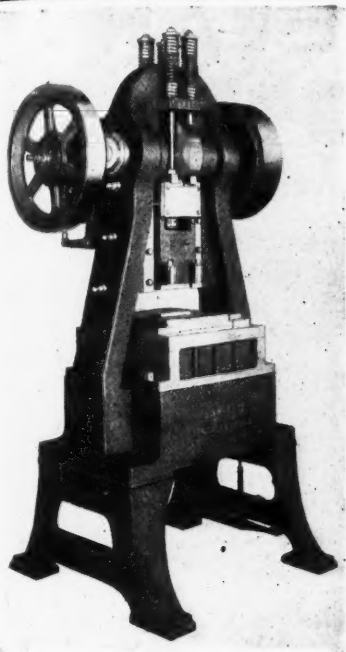
Increased Confidence—Increased Production

The Wiesman Safety Punch Press Guard sweeps the full length of the bolster plate at every stroke—entirely automatic, no button or lever to press.

The Wiesman Guard does not interfere with operation, entirely out of the way for fast feeding.

The operator works faster because free from fear of accidents, and increased production means more profit. No adjustments to make—quickly attached. Illustrated circular gives full description of the guard. May we send it?

Wiesman Manufacturing Company, Dayton, Ohio
31 to 35 South St. Clair Street



Patented

TRIM ECONOMICALLY

BLISS FLAT EDGE TRIMMERS

Many designers of pressed metal parts are not yet familiar with the possibilities opened up by this new type of equipment. Those who have already accomplished much in electrical, silver-ware, brass-ware, and miscellaneous lines.

A short motion front and back, and right and left from center, of the die or outer cutting member with reference to the punch or inner cutting member which is rigidly held, gives a clean square cut without joint marks. A floating pad on the punch locates the work, insuring a uniform height of trim line.

A piece with notches, hinge lugs or different trim levels can be trimmed as quickly and easily as a simple straight edged shell of any shape.

The machines are carefully built to give speed with accuracy and reliability. They are carried in stock in three sizes.



BLISS *for* **MACHINERY**

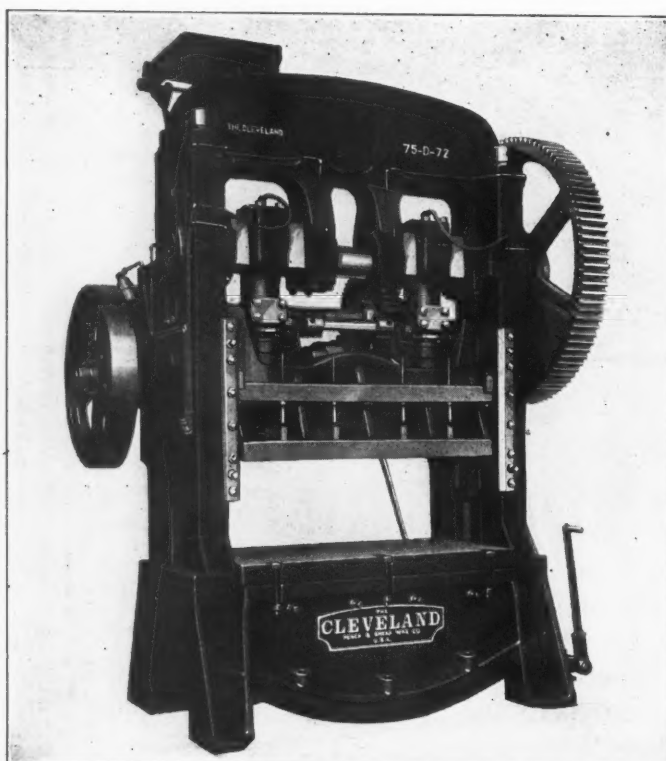
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CLEVELAND POWER PRESSES

STRENGTH—to take care
of overloads

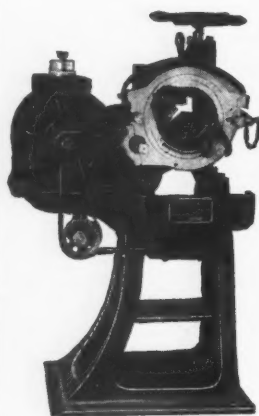
This is but one of the outstanding features of Cleveland Power Presses and it's a mighty important one.

A Power Press having a good factor of safety can safely be worked right up to its maximum capacity continuously without fear of a breakdown and a consequent disruption in production schedules.

We can furnish a Cleveland to meet every Power Press requirement



\$s Overlooked



Popular 3" Electric

Tremendous economies are frequently overlooked in the pipe threading department. It costs nothing to investigate and find out the big savings made possible by using a modern pipe machine. Our engineering department will gladly cooperate with you.

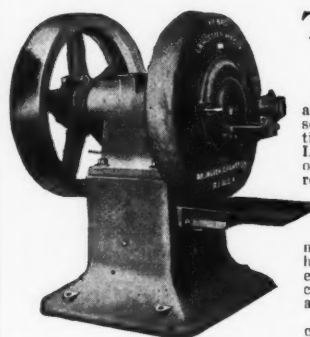
THE
Curtis
and Curtis Co.

Pipe Cutting & Threading Machines

Complete Line HAND—BELT—ELECTRIC
Portable Models 1/4-2; 1/2-3; 1-4 Inches.
Larger Models 1-6; 1-8; 2 1/2-12; 8-16 Inches.

THE CURTIS DIEHEAD IS DIFFERENT
for it does the work the simple and easy way.

Main Office and Factory
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The Skill is All in the Machine

Rotary Swaging is the modern and economical method of forming solid or tubular circular metal sections without waste of stock. The Langelier Swaging Machine reduces or tapers to a circular section, square, round, hexagonal, or similar shapes, hot or cold. We build special Swaging equipment for Tungsten Filament Wire.

Our policy is to equip the machine in every detail with work holding and feeding devices that will enable them to give the most efficient service with unskilled help at a low upkeep cost.

Machines built to date have capacity ranging from a pin point to 2 1/2" diameter on solid stock, and to 6" on tubing.



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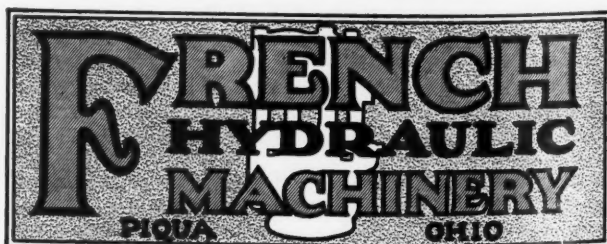
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Hurlbut, Rogers Cutting-off Machines

Have patented features found in no other machines; speeds and feeds to suit all metals. Capacity to 10" stock.

Write for catalog

THE HURLBUT, ROGERS MACHINERY CO.
Nashua, N. H.



Strength Means Economy



Even with **Massiveness!**

Modern industry requires that its machinery magnify the power of man many times over. There is no denying that even the tremendous lifting strength of massive cranes is economical.

• • **L-J Punch Press** • • **Strength is Concentrated!**

BY designing an inclinable punch press, and putting strength where strength is needed, the Loshbough-Jordan engineers, over 15 years ago, solved 90% of today's punch press troubles.

LOSHBOUGH-JORDAN inclinable press owners testify to the greater strength of their machines, and because of this great strength, their records show material savings in their stamping costs. L-J Presses are made in inclinable types only from 5 to 52 tons capacity.

Built Like a Machine Tool

All parts of LOSHBOUGH-JORDAN Presses are machined to close limits. Bearings are blued, scraped and fitted by hand.

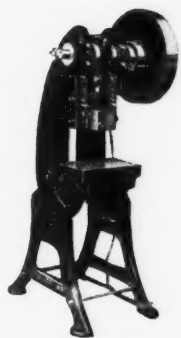
Crankshafts are made of highest grade 40' carbon steel accurately ground on Norton grinders.

The clutch is safe, powerful and durable. For a small additional charge a patented combination non-repeat or continuous tripping device is installed.

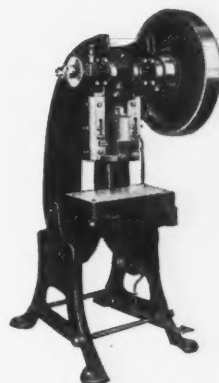
An exclusive lubricating system efficiently oils all working parts.

Write for more detailed information. You can investigate without buying—why buy without investigating? Let us set an L-J Press in your plant on thirty days' trial.

We are in position to furnish quotations on your die and tool specifications



No. 1 Fly Wheel Press
Capacity 10 Tons.



No. 3 Fly Wheel Press
Capacity 22 Tons.

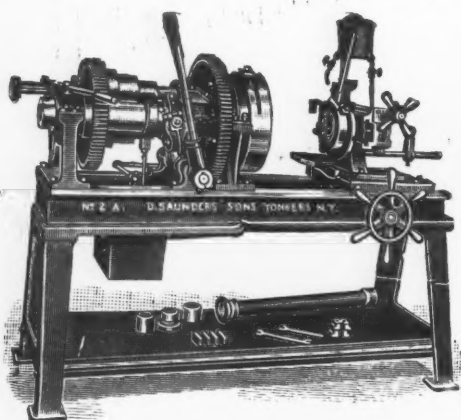
Loshbough-Jordan Tool & Machine Co.

Exclusive Builders of Inclinable Presses for 15 Years

ELKHART

INDIANA





The Saunders' Pipe and Nipple Threading is Profitable

SAUNDERS' Pipe Threading, Cutting and Nipple Machines with patent lever gripping chucks and new type adjustable expanding dieheads with interchangeable chasers.

No. 0 range $\frac{1}{8}$ to $\frac{3}{4}$ ", inclusive. No. 3-F range $\frac{1}{2}$ to 3" inclusive.
No. 2-A range $\frac{1}{4}$ to 2" inclusive. No. 4-C range 1 to 4" inclusive.

Above machines made in both belt and motor drive. Other sizes of machines to meet all conditions range $\frac{1}{8}$ to 18" inclusive. Send us your inquiries.

D. Saunders' Sons Inc., Yonkers, N. Y.

Get three times the production on threading

Your production on threading work runs about three times as high as with other methods when you use the RAPIDUCTION—with labor costs going down accordingly.

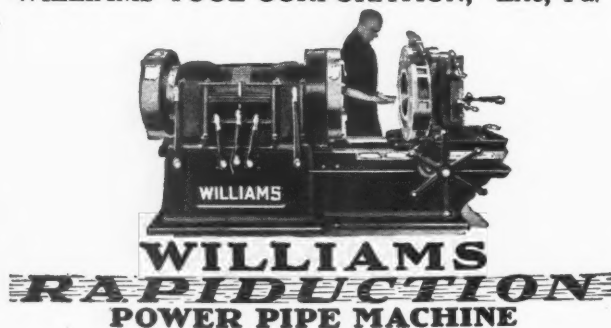
And look at the saving on dies:


A complete set of dies for the 12-inch RAPIDUCTION, for instance, weighs only 8 pounds—which is 136 pounds less than the weight of a set for the old type threading machine.

The dies are easy to handle, and individually replaced. If you snip one, you renew that one only.

Drop us a line for a full description of this "fast machine built to stand the pace" and for reports from RAPIDUCTION users.

WILLIAMS TOOL CORPORATION, Erie, Pa.



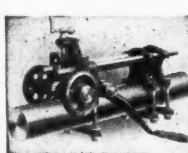


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A Post Card addressed to **The Armstrong Mfg. Co. Bridgeport Conn.** will bring a complete catalog of adjustable stocks and dies—pipe cutters and pipe threading machines and other useful tools for the man who handles pipe

ARMSTRONG

BURR
KEY SEATERS
CUT PERFECT
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IN SHAFTING
ANY SIZE, ANYWHERE
SAVE DELAYS AND MONEY



Useful everywhere, necessary, in the repair shop.

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PIPE THREADING for BETTER threads MACHINES
TOLEDO, OHIO

Hydraulic and Hydro-Pneumatic

Straightening Presses

In Capacities of from 10 Tons to 200 Tons

METALWOOD MFG. CO. 3358-3366 Wight Street, **DETROIT—MICH.**



40% production increase with this G-F-P Press

Continental Motors reports a 40% production increase in cutting spiral oil grooves in valve tappet bracket guides since this operation was put on a 3-ton General Flexible Power Press. And at Continental it is a foregone conclusion that the job is done right.

This job is simply one of a wide variety of operations upon which the 3-ton G-F-P press has made substantial savings. It is also used extensively for broaching, burrishing holes, arbor press work and many assembling operations.

The operator can vary the applied pressure from a few pounds to the machine capacity by slight changes in pressure upon the foot pedal. He has both hands free at all times to efficiently handle the work.

General Flexible Power Presses are made in sizes up to 60 tons and types to suit any requirements. Recommendations regarding their application to your particular problem will gladly be made. Let us show you how you can materially reduce costs of straightening, bending, broaching, assembling and many other operations.

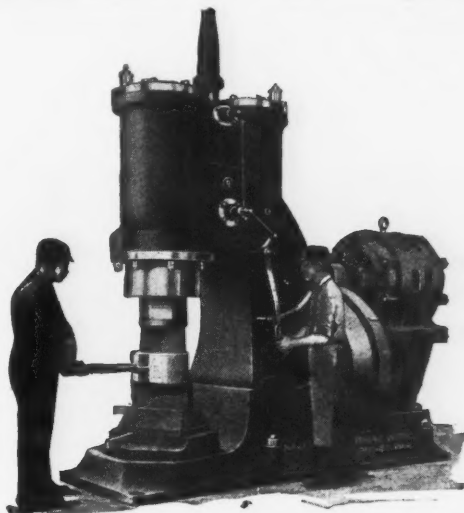
General Manufacturing Co.

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OVER 1000 FIRMS

*in 38 different Industries
are enthusiastic users
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NAZEL FORGING HAMMERS



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“There Must Be a Reason”

The A. C. Nielsen Company of Chicago, made ACTUAL PERFORMANCE SURVEYS for us of Nazel (Air Driven) Forging Hammers, which prove they offer more advantages and are cheaper to operate and maintain than other types of Forging Hammers.



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also makers of the DILL SLOTTER

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- ☐ Nielsen Performance Surveys.
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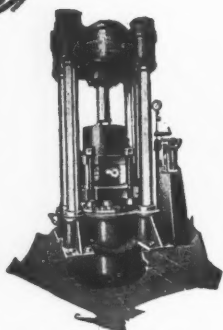
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Co. Name.....

Street

City..... State.....

M-8A



2100 Ton Lead Press
for covering cable and
vulcanizing rubber hose.



Curb Press
for Reclaiming
Liquid Products



WATSON-STILLMAN HYDRAULIC PRESSES

*Are Characterized by Their Strength and
Simplicity—Their Rugged Construction Will
Stand Up Under Most Severe Conditions*

If you have a production problem on which hydraulic pressure can be used we have a press that is adapted to your work.

Rubber Works, Paper, Pulp and Powder Mills, Chemical Plants and many other special industries have found Watson-Stillman Presses best suited to their work.

We build complete hydraulic plants including pipe, valves, pumps, accumulators, intensifiers, and presses for every purpose such as:

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Thermo Plastic Moulding
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Oil Extracting
Cocoa Butter Extracting
Compressing and Forming, Etc.

Write for Bulletins

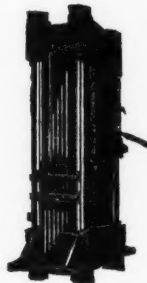
The Watson-Stillman Co.

73 West Street

NEW YORK CITY

Chicago, 549 W. Washington Blvd.
Philadelphia, Widener Building

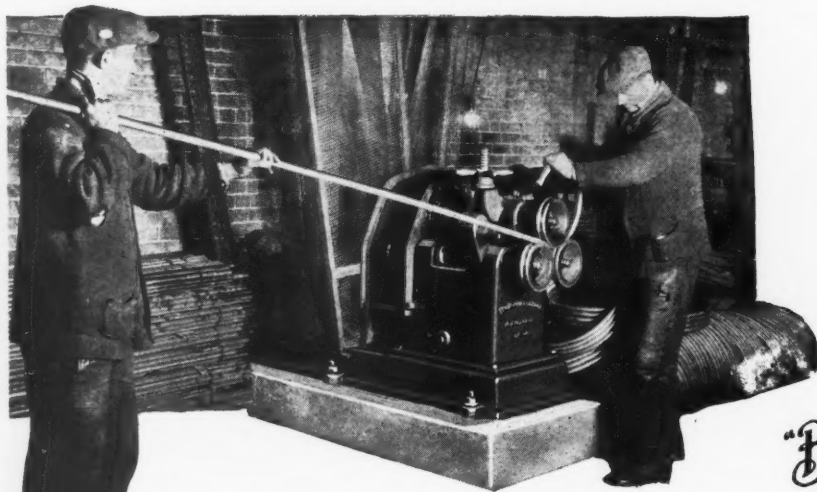
Cleveland, Auditorium Garage Bldg.
Detroit, 7752 DuBoise St.



Multiple Plate
Heating Press



Rapid Working
Press
for Bakelite Redmanol
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*This same machine with
different sets of inter-
changeable rolls can be
used for bending angles,
tees, channels, beams,
squares, flats, rounds,
steel pipes, or copper
tubing.*

"Buffalo" Bending Rolls

THE Republic Metalware Company, Buffalo, N. Y., are enthusiastic over the performance of their "Buffalo" Bending Roll. With it they bend 1 in. gas pipe into 16, 18 and 20 in. circles for use as top hoops on ash cans. A whole length of pipe is bent into a continuous spiral and then cut into sections and welded. One machine turns out 150 circles an hour. If you bend metal, a "Buffalo" will save you money.

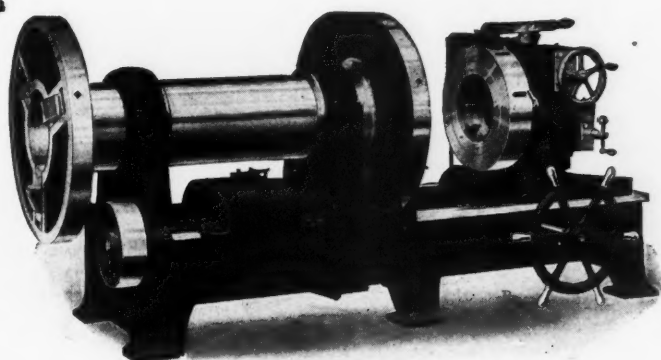
Buffalo Forge Company

144 Mortimer

Buffalo, N. Y.

In Canada - Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

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We have helped thousands of users to threading satisfaction, and will be pleased to put our 50 years' experience at your service.

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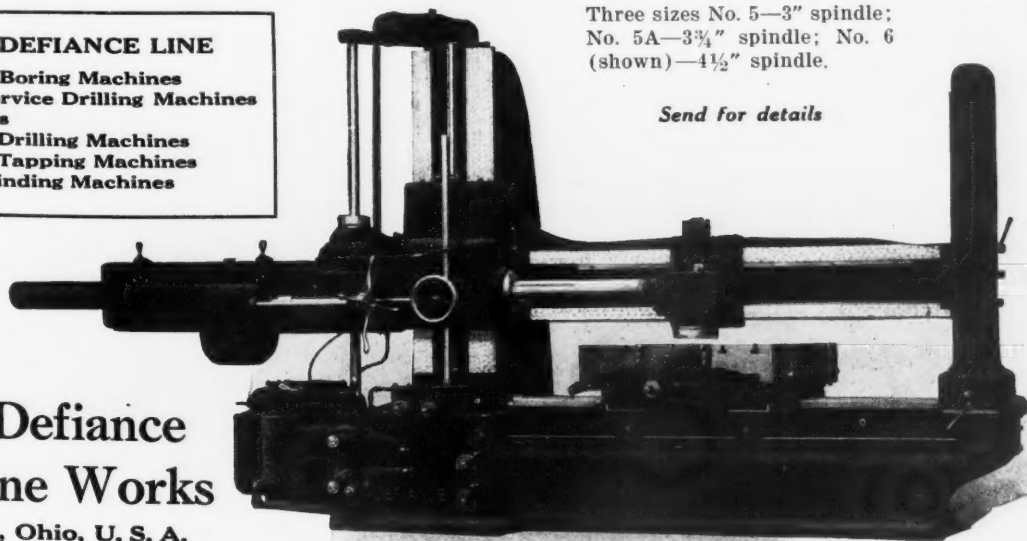
The Defiance Horizontal Boring, Milling, Drilling and Tapping Machines—heavy duty equipment that works to precision limits on big work; powerful machines that insure profitable speedy production on single operations and manufacturing.

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Heavy Service Drilling Machines
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Three sizes No. 5—3" spindle;
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(shown)—4½" spindle.

Send for details



**The Defiance
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Defiance, Ohio, U. S. A.

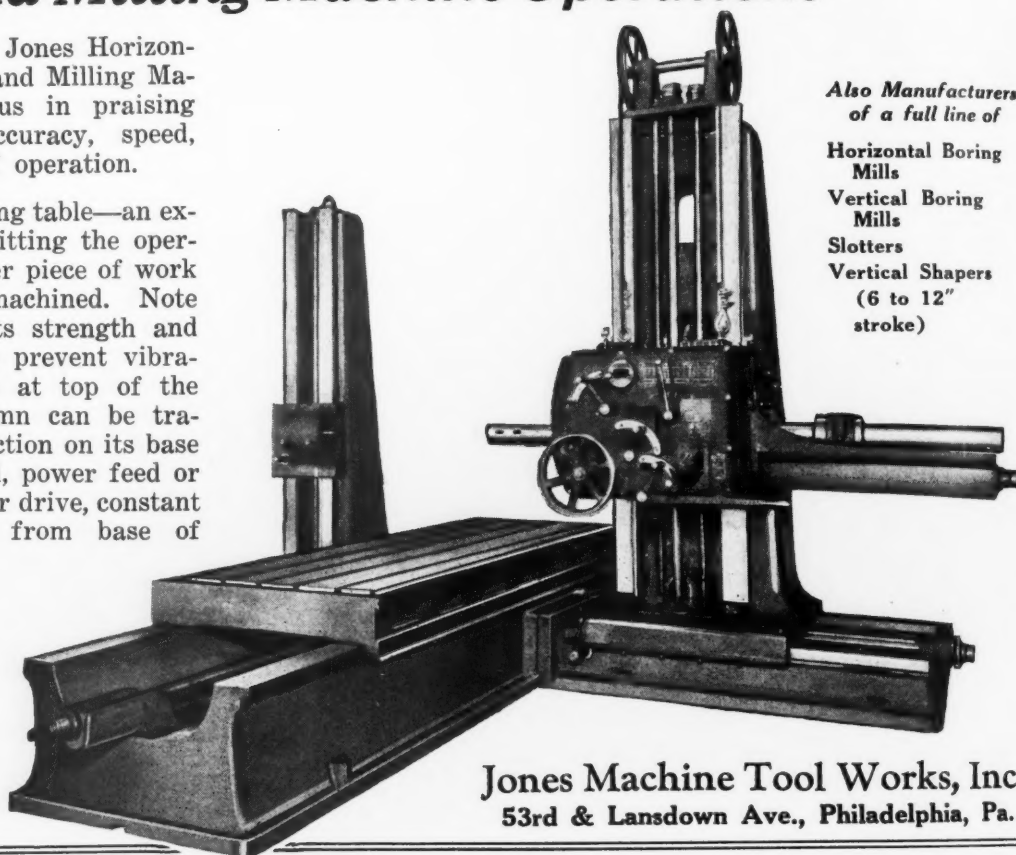
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Send for full details of the Jones Line



Also Manufacturers of a full line of

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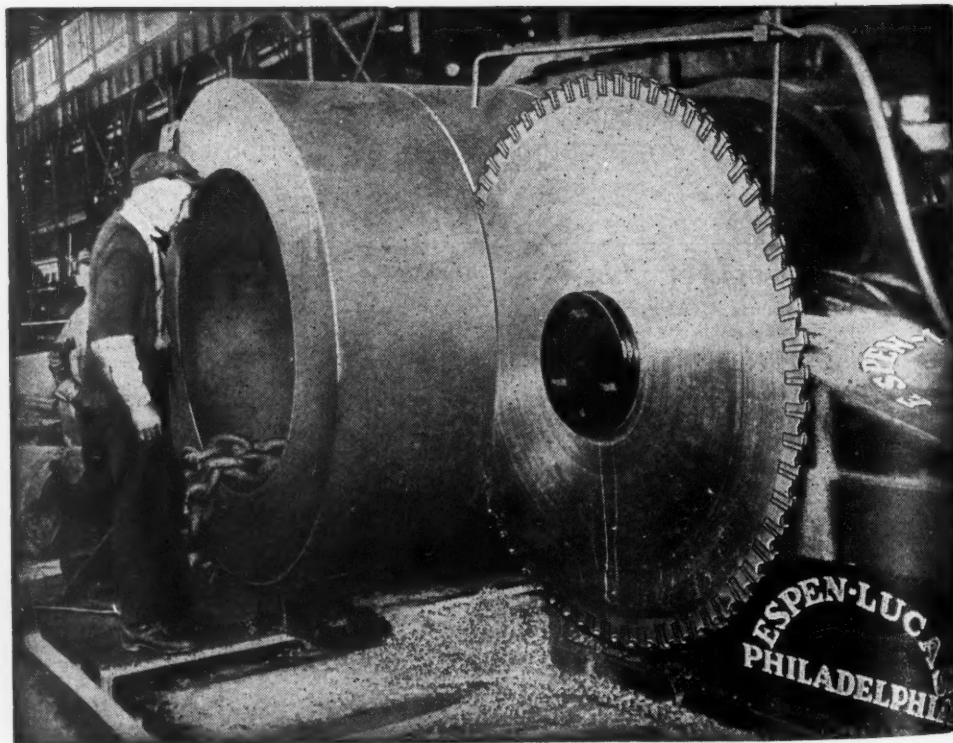
(6 to 12" stroke)

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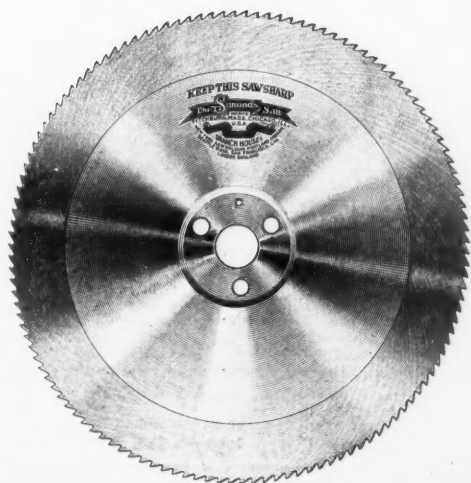
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Tell us your needs, we have the knowledge, experience and will to correctly advise.

190 types and sizes of Sawing Machines for sawing all kinds of metal.



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Solid Metal Cutting Saws

Durable under severe service and reliable on accurate work. Made of high-grade steel, scientifically tested and tempered to a degree that has proved up in performance. Longer runs at faster speeds.

Order from any Simonds branch or service station

Simonds Saw and Steel Company

"The Saw Makers"

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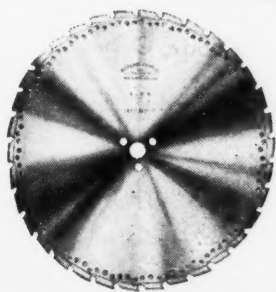
Chicago, Ill.
Boston, Mass.
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Lowest Cost per Cut with



HUTHER SAWS

The special inserted teeth of high speed steel make Huther Saws profitable and economical. Inserts give $1\frac{1}{4}$ " wear before replacing—and replacements cost but little. The saws are shaped to give proper clearance to the teeth at all times.

The Huther line covers saws for every purpose. You can try one at our expense. May we send it?

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BAND SAWS

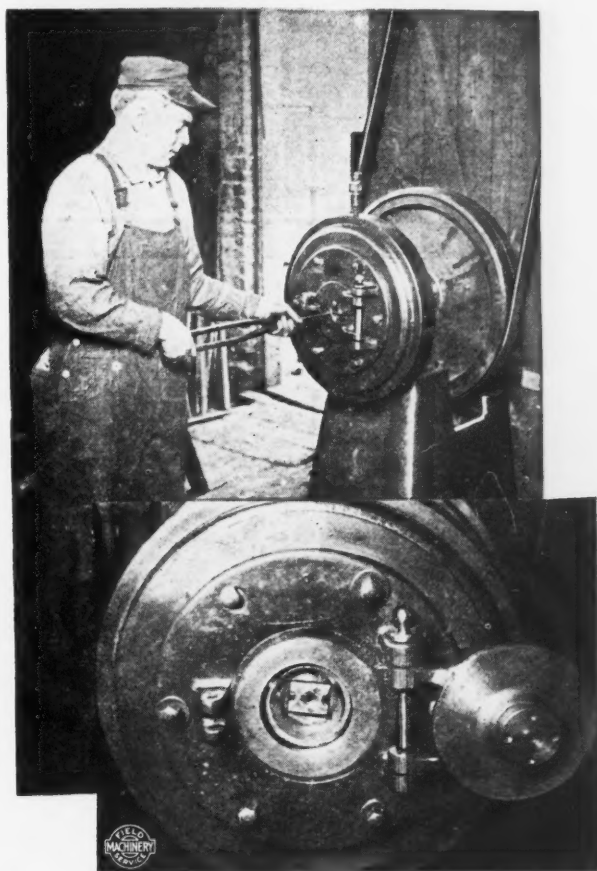
"The Tools in the Plaid Box"

AMERICAN SAW & MFG. CO. SPRINGFIELD, MASS.

HACK SAWS - BAND SAWS - SCREW DRIVERS - GLASS CUTTERS

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Two Rods a Minute



The operator is reducing steel rods to meet the following specifications: 15" long over all, with a $\frac{1}{4}$ " diameter for 3" and 3/16" diameter for the other 12", both diameters to be accurate to .002". The job came in marked "rush" and production time—120 finished rods per hour—was completely satisfactory.

Etna Rotary Swaging is fast and accurate; the Etna reduction method improves the quality of the metal, increases the durability of the rods and tubes as it swages them to size.

If you reduce or swage rod or tube in large or small quantities—send for details of Etna swagers.

The Etna Machine Company

Toledo, Ohio

MAPLEWOOD AVENUE AND CASTLE BOULEVARD



RACINE

Shear-Cut Leads a Complete Line
"STANDARD THE WORLD OVER"

According to men of the widest experience—shop owners—superintendents—engineers, Racine SHEAR-CUT has done more to speed up metal cutting with *accuracy*, and *economy* than any other development of 15 years. From official reports: Time per cut does not vary. Life of saw blades tripled. Cutting time reduced a third to a half. Whatever your cutting problem you can be sure Racine will furnish just the right tool. Send for Bulletins.

And don't forget the Free Chart. "The Right Saw for the Purpose." A valuable cutting guide. Sent on request.

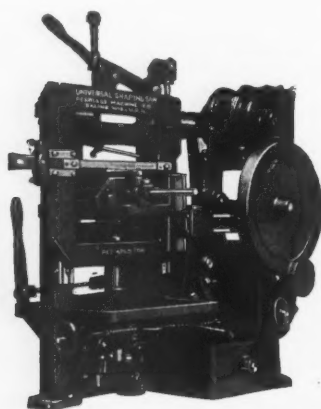
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Peerless SAWING MACHINES

The principles of construction and operation incorporated in Peerless Sawing Machines have been tested over 10 years of practical application and found 100% efficient in every respect.

Rigidity of the saw blades is one such feature. They are held in such a manner that cutting can be done on a production basis and the sides of the piece kept parallel to 1/64", eliminating machining.

Send for catalog giving all features.



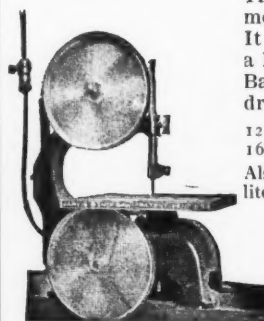
(1) The Peerless High Speed Universal Shaping Saw, made in 6" x 6"; 9" x 9"; 13" by 13" sizes.
 (2) Peerless High Speed Metal Saw 6" x 6"; 9" x 9"; 13" by 16" sizes.

Also Peerless U. S. A. Power Blades and Peerless Duplex Hand Blades. Write for complete descriptions.

**PEERLESS
MACHINE
COMPANY**

1218 16th St.
RACINE, WIS.

The "JARVIS" Bench Band Saw For Metal Sawing Operations



The "Jarvis" Bench Band Saw cuts metals—straight, curved or bevel. It is motor driven, operates from a lamp socket and is vibrationless. Ball bearing disc wheels, worm drive.

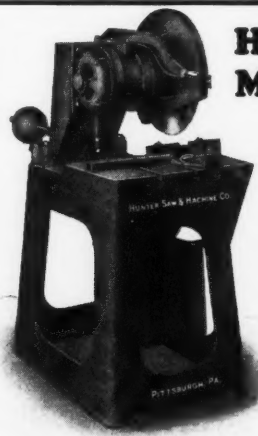
12" size cuts up to 1 1/2" cold rolled steel.
 16" size cuts up to 2" cold rolled steel.

Also made for cutting soft metals, Bakelite, fibre, transite, wood, etc.

Details gladly sent upon request.

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NEWARK NEW JERSEY
 Walls Sales Corp., Agents
 96 Warren St. New York City

Hunter High Speed Metal Cut-off Saw Model O



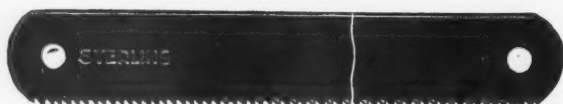
This machine cuts thin metal sections up to 7"x2"—5"x2 1/2"—3"x3 1/2"; the average time is from 3 seconds to instantaneous.

Bulletin No. 19 describes it fully

**Hunter Saw &
Machine Co.**

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HACK SAW BLADES

Quality for Over Quarter
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ESTABLISHED 1898

MANUFACTURED BY

Diamond Saw & Stamping Works
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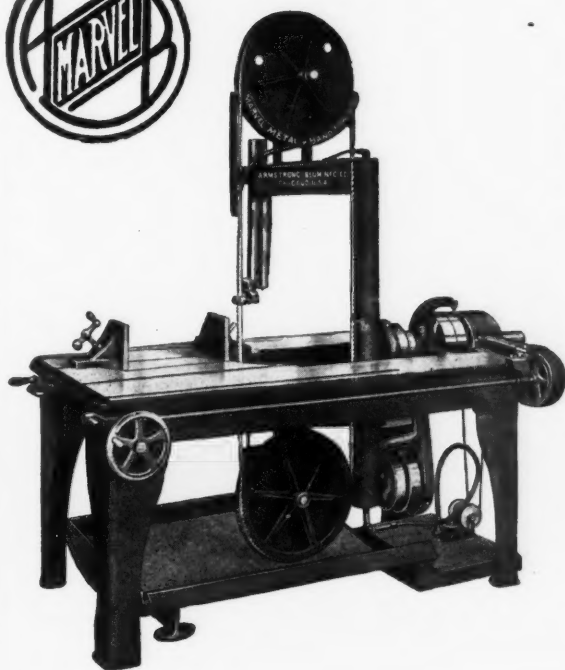


**DISC LAST
INDEFINITELY**
 Specially treated teeth
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**Taylor Newbold
Inserted Tooth
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The Tabor Mfg. Co., Philadelphia, Pa.

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in every metal industry, in every type of plant, find the Marvel Metal Band Saw No. 8—a valuable asset to economical shop work.

It handles solid bars, beams, channels, angles, tubing, &c., and including die work. It is particularly useful FOR ALL THIS WORK, as it will cut off square, or at any angle to right or left up to 45 degrees.

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Send for details and a list of plants using the Marvel Metal Band Saw No. 8. Ask for catalogs of Marvel Automatic High Speed Saws, Hack Saws, Band Saws, Punches, Shears and our new high-speed-edge hack saw blades.

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is the standard with which wood working machinery is generally compared. Select your wood working equipment from the Crescent line as there is only one source of Crescent quality.

The Crescent line consists of band saws, saw tables, self feed rip saw, shapers, jointers, variety wood worker, planers, planer and matcher, disk grinders, swing saws, cut off table, borers, hollow chisel mortiser, tenoners, universal wood workers.

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TRADE MARK

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for melting Babbitt, Lead, Tin Solder will reduce your melting costs.

Standard sizes
10 lb. to 1500 lb.
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Send me leaflet TB-10 telling about TRENT ELECTRIC MELTING POTS.

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TO change baser metals into gold—how oft we've been told of this wild day-dream of the ancient alchemists.

They strove for gold; yet this metal, precious as it is, has never in all its ages been of the practical utility of Tool Steel.

And today any attempt to produce high grade Tool Steel from baser elements has proved as futile as mediaeval man's chase for the elusive yellow metal.

*"The Steel
Makes the Tool"*



COLONIAL STEEL COMPANY

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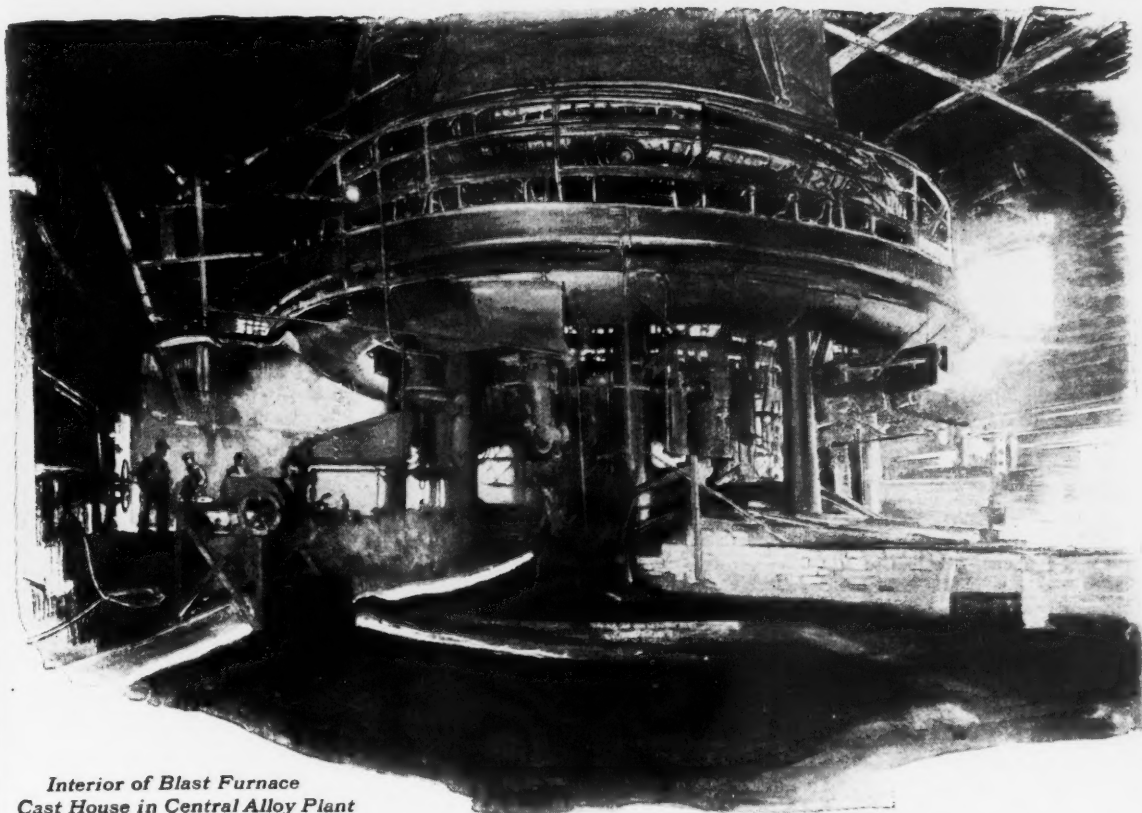
Philadelphia
St. Louis

The high standards which are so rigidly maintained on all materials that enter into every brand of Colonial Tool Steel are a source of pride in the Colonial mill. Colonial brands have been the standard of comparison for 25 years.

Good Tool Steel begins with good material—not with the alchemist.

Of good Tool Steels, is your shop using Colonial No. 7? It's a Vanadium water-hardening Tool Steel, successfully used for a remarkably wide variety of purposes—a real production steel.

COLONIAL NO 7 TOOL STEEL



*Interior of Blast Furnace
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Alloy Steels That Start Right

AGATHON Alloy Steels enjoy the highest reputation because extreme care is taken in all steps of manufacture. From the blast furnace to the finished product, no pains are spared to assure a perfect product.

Constant scrutiny over every step of manufacture, strict adherence to formula, painstaking care in chemical analysis and the use of the microscope in checking heats enable us to provide alloy steels of uniform excellence.

Users of Agathon Alloy Steels very often effect immense savings in machining operations alone, on account of the uniformity of these super-steels.

Central Alloy Steel Corporation, Massillon, Ohio

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Syracuse
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Makers of Toncan Copper Mo-lyb-den-um Iron
Detroit
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Los Angeles

New York
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We have daily production in our two completely equipped plants at Massillon and Canton in all kinds of Agathon Alloy Steels, such as:

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Deliveries in Blooms, Billets, Slabs, Hot Rolled, Heat Treated, and Cold Drawn Bars, Hot Rolled Strips, etc.

AGATHON ALLOY STEELS

JALCASE

TRADE MARK

The Gold Medal Steel

**100% Production Increase
300% Longer Tool Life
with JALCASE on
this Stoker Worm**



Production Doubled—Tool Life Tripled

The Stoker Manufacturer who used JALCASE steel in the production of the worm illustrated above, advises us that they are able to machine twice as many worms in a given length of time as they were formerly able to get from 1020 steel—In other words, a *production increase of 100%*. In addition to this big saving, they found that their cutting tools stand up just three times as long with JALCASE as with the steels formerly used. This is a *300% increase in tool life* and a *decrease of 200% in tool costs*.

*JALCASE STEEL was
awarded a GOLD
MEDAL at the Sesqui-
Centennial.*

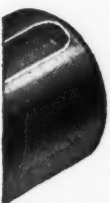


JONES & LAUGHLIN STEEL

American Iron and Steel Works

New J & L Free Cutting Case~Carburizing and Forging Steel

What Could You Save With JALCASE?



TAKE your pencil and do some figuring on your own products and see where you might save money if you adopt JALCASE, the new, special J & L Steel that is creating such universal interest in the machinery field. What would doubling your production and tripling your tool life by use of JALCASE mean in dollars and cents in your factory?

Many manufacturers advise us with enthusiasm of production gains when they use JALCASE running from 20% to 100%, of extension of tool life from 50% to 300%, of better results in case hardening, of faster machining, more satisfactory forging and many other advantages, all of them contributing to LOWER COSTS OF PRODUCTION.

Saves \$75,000 A Year By Using JALCASE

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"The adoption of JALCASE steel will mean a saving estimated at \$75,000 per year."



Uses JALCASE To Meet Competition

From Philadelphia comes this terse but significant comment:

"Foreman is asking for JALCASE whenever he has a job requiring fast production and low manufacturing costs to meet a low competitive selling price."

J & L COLD FINISHED STEEL

Jones & Laughlin were the inventors of cold rolling and have been engaged in cold finishing bars and various shapes for more than 60 years. We are the largest producers of cold finished steel who own and control materials and processes from the ore to the finished bars. The highest award at the Sesqui-Centennial, in Philadelphia, the Grand Prize, was awarded to us for our Cold Finished material.

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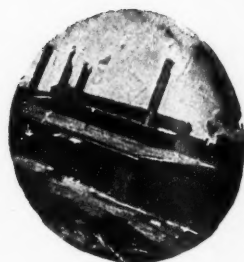
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Hand Book.

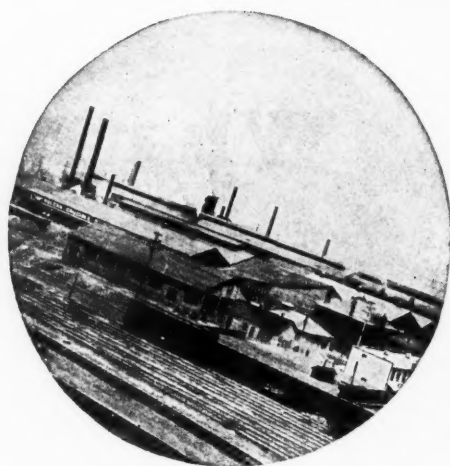


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*Quality and Uniformity
made this growth
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Plant Today



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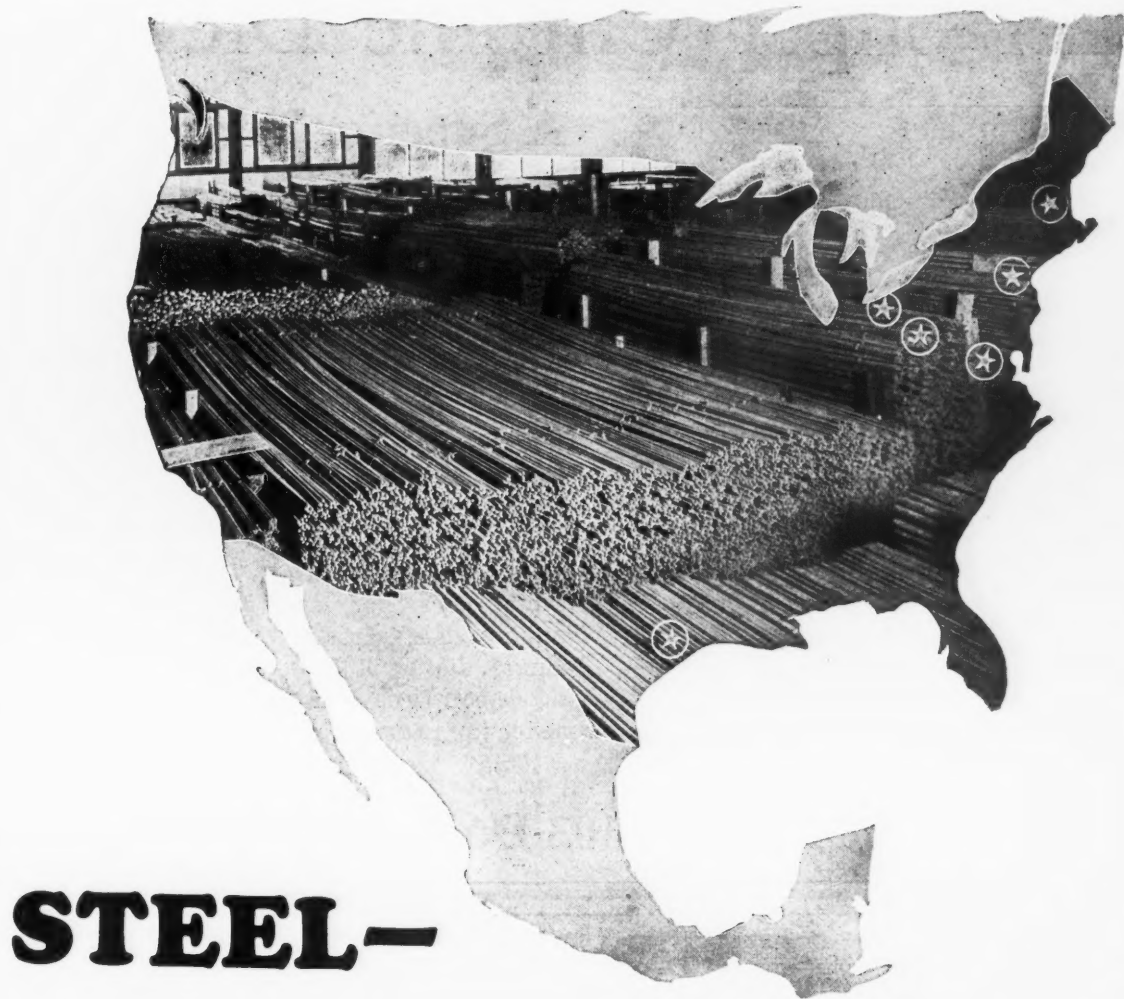
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Established 1900

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Chicago: 16-18 South Clinton St. St. Louis: 823 Wainwright Bldg. Detroit: 4843 Bellevue Ave. Philadelphia: 512 Commerce St. New England Representative: Hartel Bros. & Co., 85 West First St., South Boston, Mass.



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If you have not received a recent edition of our Warehouse Stock List, we shall be pleased to mail you a copy. Your name on our mailing list will keep you advised at all times.

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1822

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A Superior Forming Steel

Super-Chrome Die Steel has established itself as far superior in every respect to high speed or carbon steel for forming dies. In actual competitive tests it has shown greater productive capacity, longer runs and the ability to withstand an abnormal amount of wear and abrasion.

This new Die Steel is a High Carbon-Chrome Alloy Steel which hardens free from scale in oil without shrinking or warping. It will increase production and lower costs, not only in forming dies, but in blanking dies, thread rolling dies, plugs, gauges, etc. Drop us a line for further details.

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STEEL—in bars, strips, sheets, rods, blocks—in rounds, squares, flats, hexagons, octagons, and other shapes, regular and special.

Steel—Oil or water-hardening, high or low carbon, alloy steel of all kinds, magnet steel, stainless steel or iron, non-corrosive steels.

Steel—for tools, for machine parts, for special uses; high speed, straight carbon or machinery steel, screw stock, turned and ground shafting. Thousands of tons are carried in Hawkridge's Boston stock and close contact with the mills is maintained daily.

Steel—steel for new England, co-operation in selecting, working and heat-treating steel, that is the business of Hawkridge Bros. Co. Write them about steel or phone Hancock 5620.



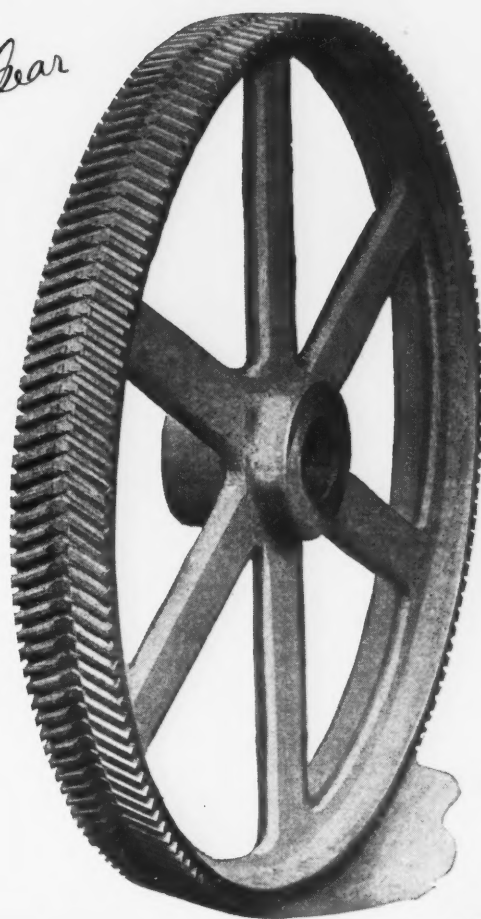
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Products

Spur, Bevel, Herringbone, Helical, Intermittent and Worm Gears; Rawhide, Micarta, Fabroil and Textolite Pinions; Racks, Ratchets, Sprockets and Chains. Every Type of Gear Driven Speed Reducing Unit.

*Hurry orders and Breakdown Jobs
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Please send me a copy of the Gear Book—gratis.

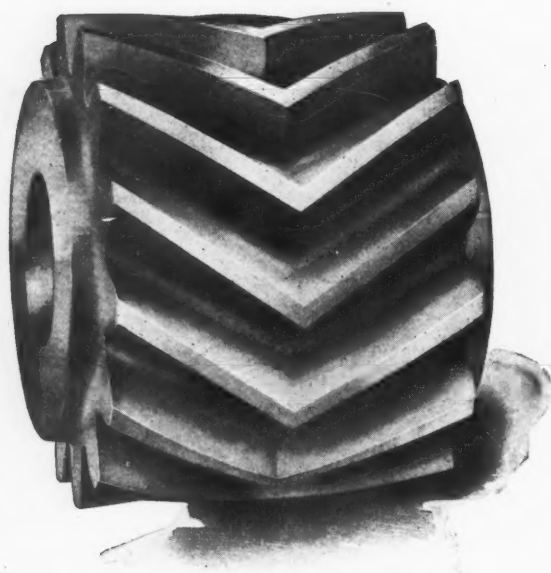
Mr. Title.

Co. Name.

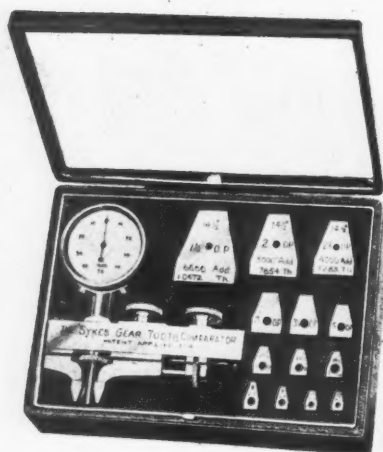
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M-8

MACHINERY, August, 1927—185



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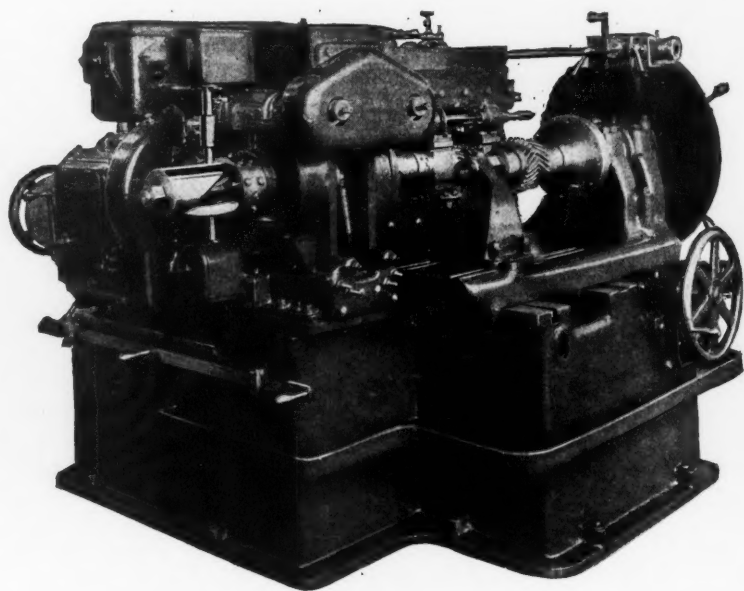
Ask us about our instrument
for gauging gear teeth

FARREL-SYKES Gears will transmit motion with uniform angular velocity which will eliminate the possibility of chatter marks on the product and save the machine they drive from the destructive effect of vibration and shock.

Their adoption will supply a sales feature which will increase sales, both before and after they are sold.

They can be obtained at prices little or no higher than accurate straight tooth gears, and when production increases a continuous supply at low cost can be ensured by the purchase of machines for cutting them.

Let us tell you more about both gears and machines. Write for new gear book.



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Havana, Cuba, Edificio Canada
San Juan, Porto Rico



A Carload of Better Drives

THE above photograph shows part of a shipment of 82 type "A" Ganschow Planetary Transformers (a carload) ready for shipment to one of Detroit's most progressive manufacturers.

Again GANSCHOW TRANSFORMERS ARE THE CHOICE OF INDUSTRY.

The engineer that chose to place his entire order for these transformers didn't gamble—he knew that such sterling quality as hardened gears throughout, forged steel driving

plates, hardened and ground studs, treated and ground shafts, semi-steel housings, and many other features, including three internal bearings, meant that these power transformers would be in accordance with the quality of his own products.

Such confidence, such faith, can only be attributed to the achievements of Ganschow's fifty-six years of experience in making gears and transformers, and an ultimate effort to serve industry with a better speed transformer.

William Ganschow Company

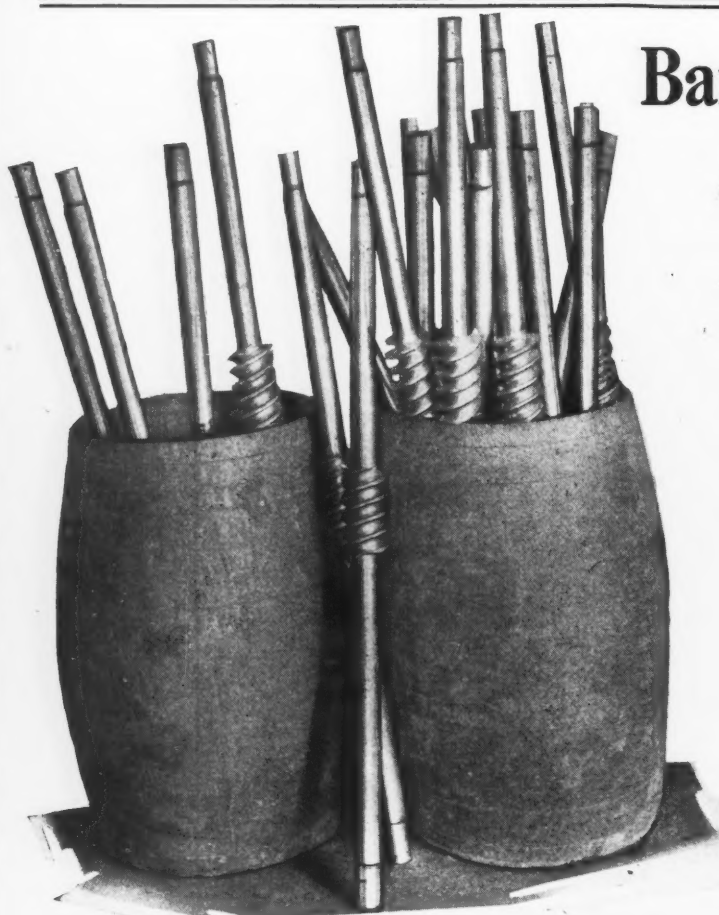
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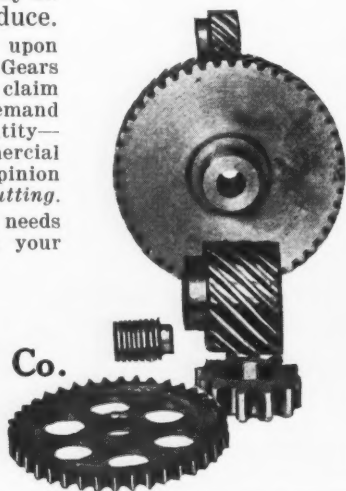
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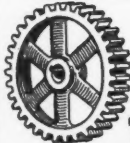


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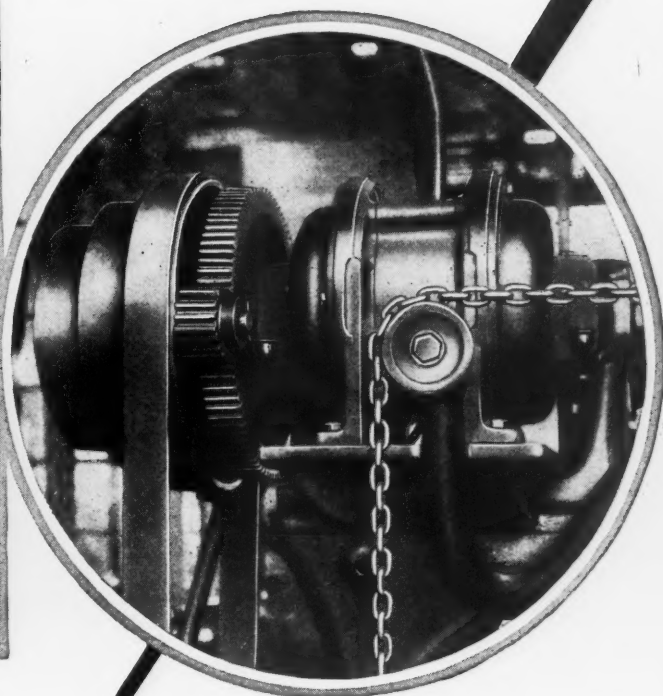
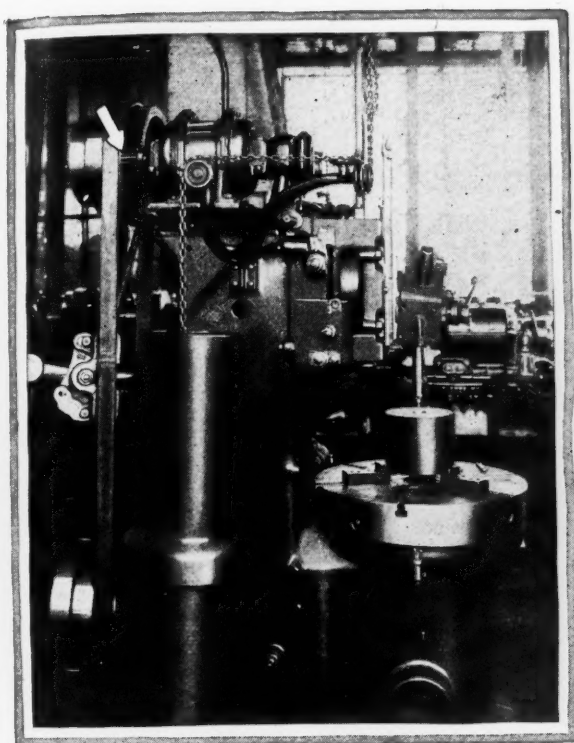
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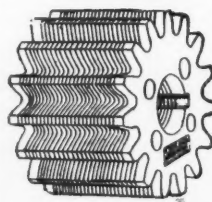
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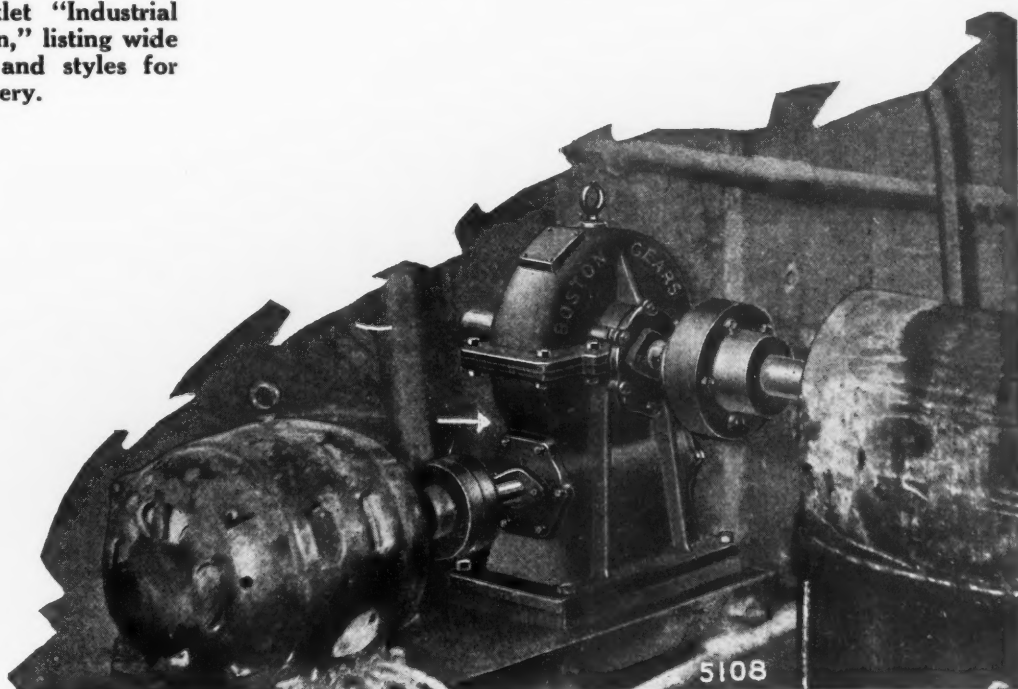


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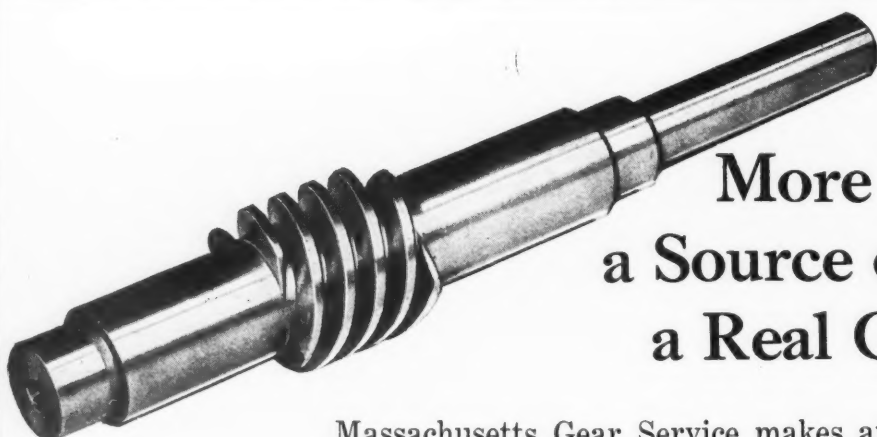
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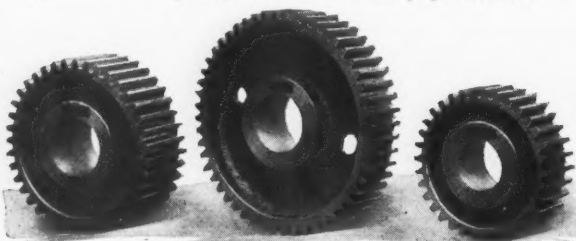
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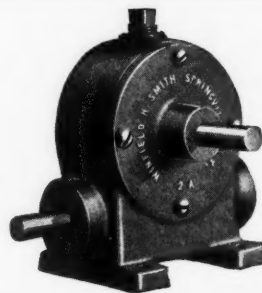


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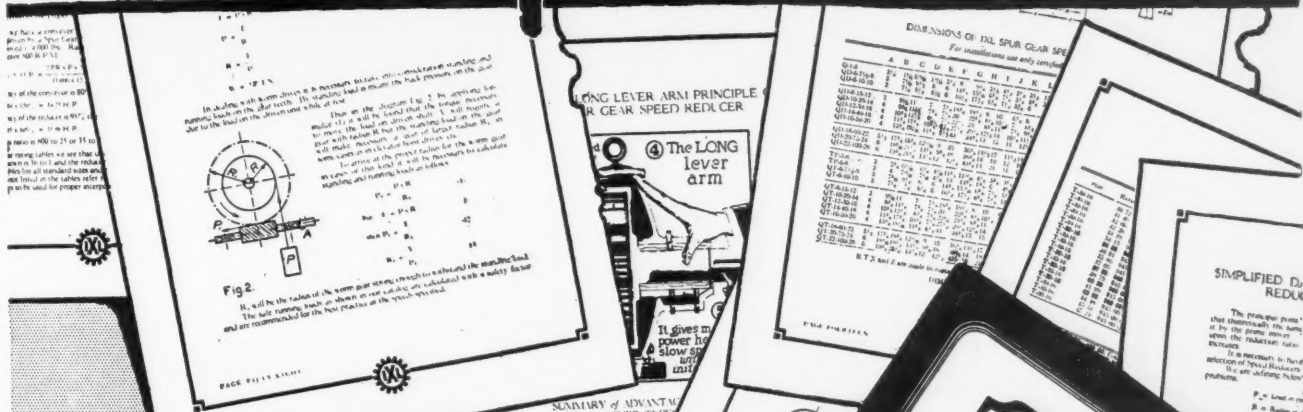
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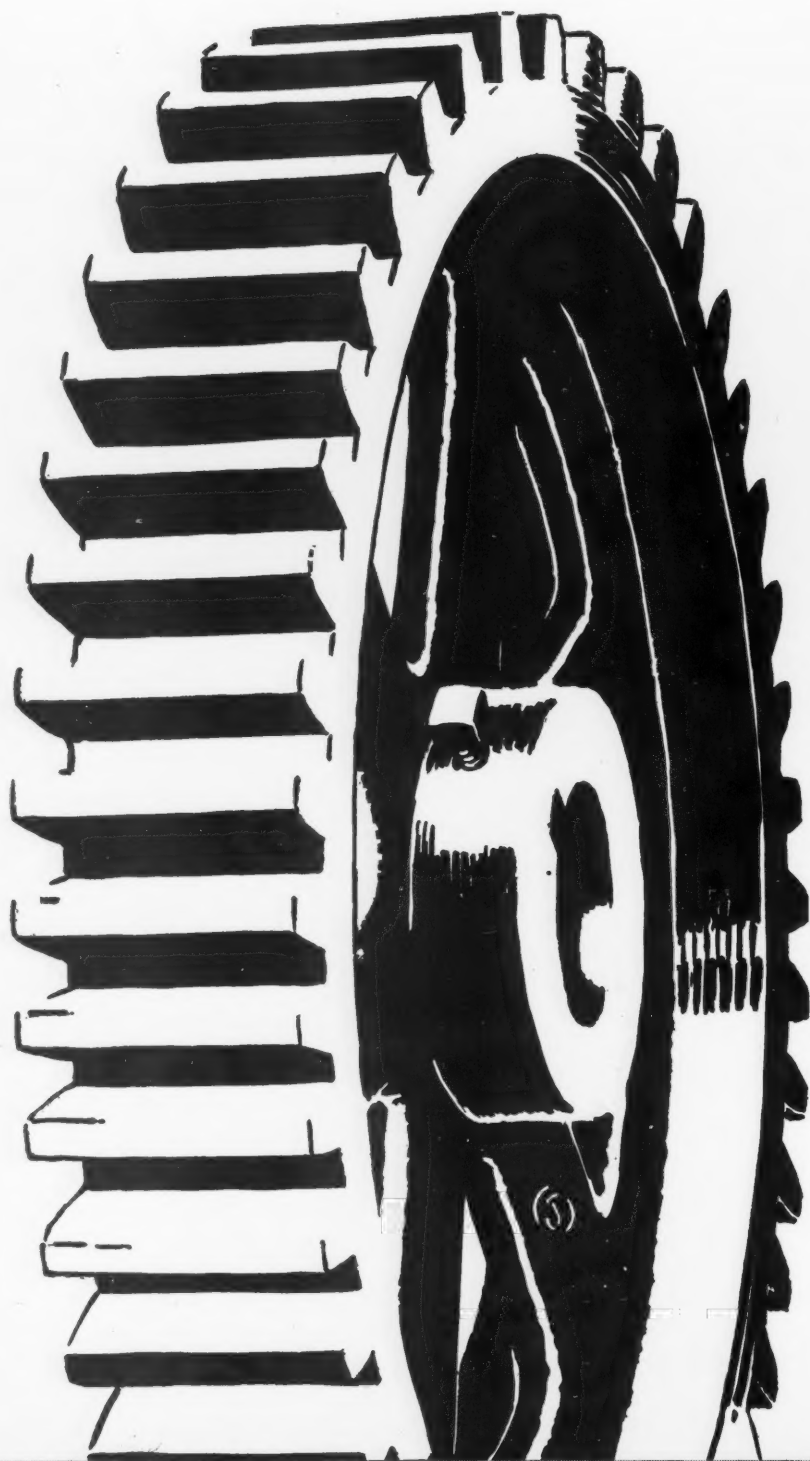
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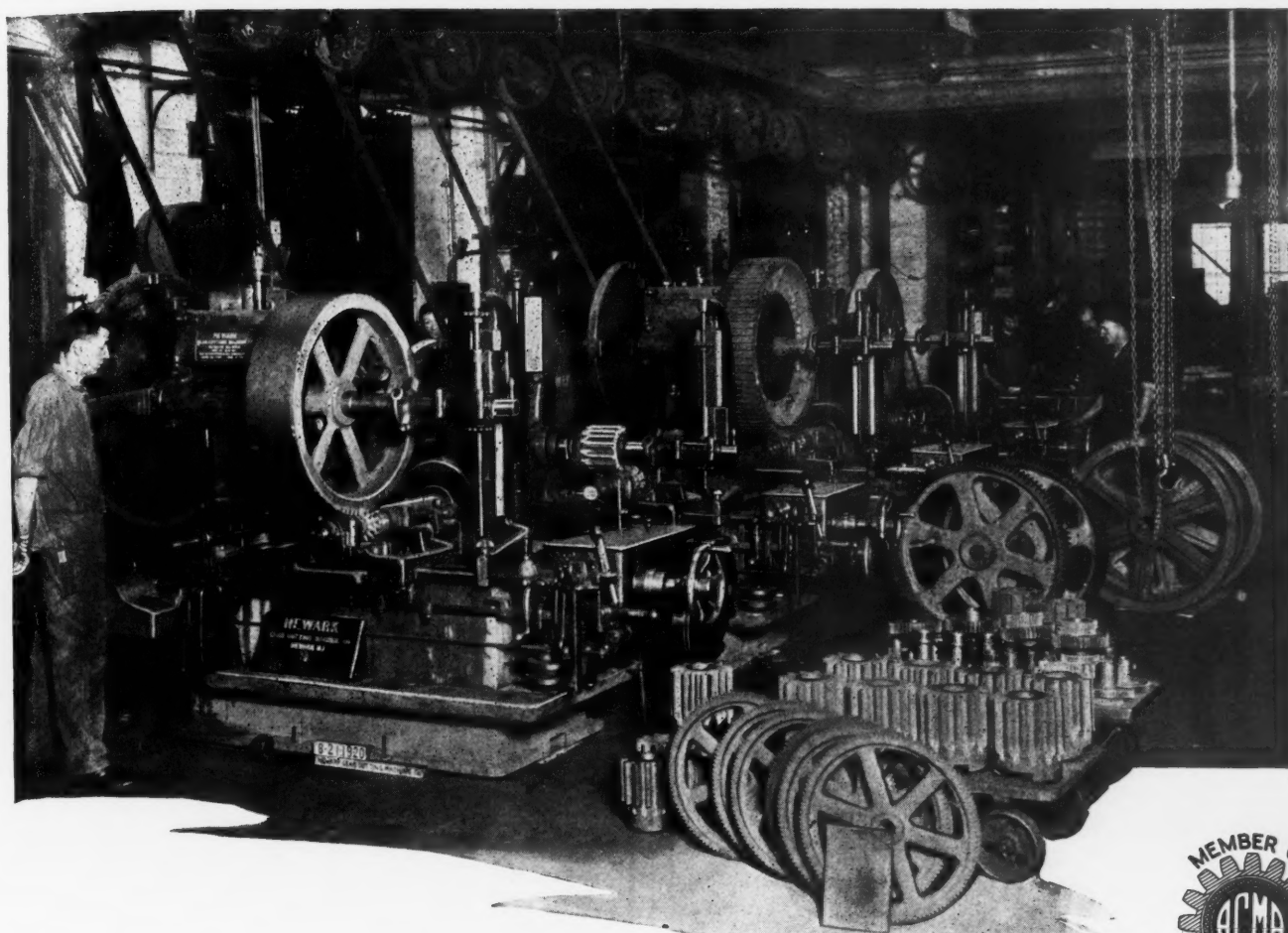
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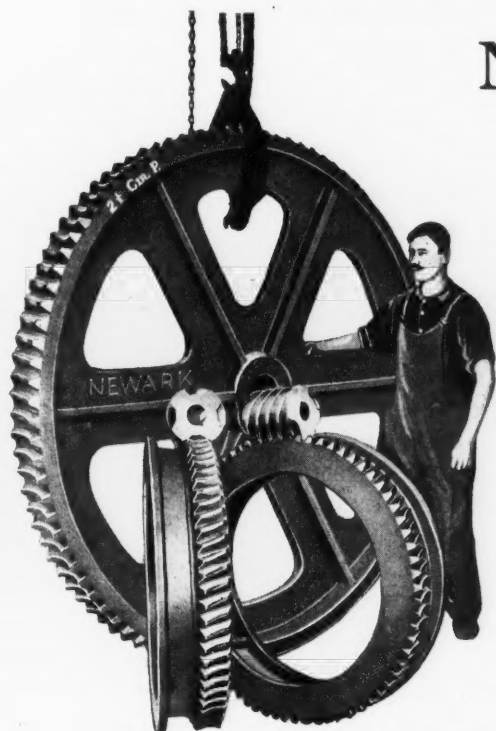
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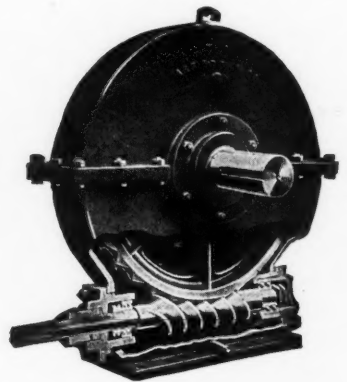
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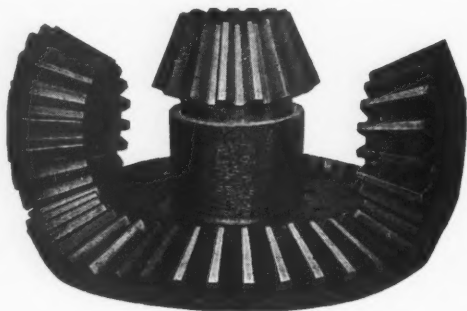
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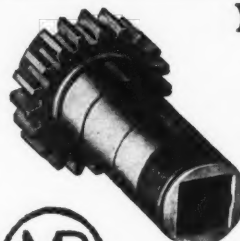
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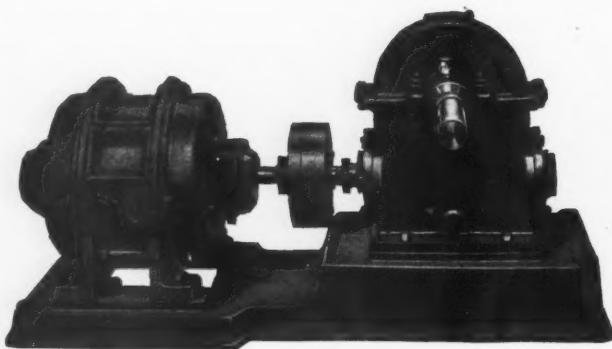
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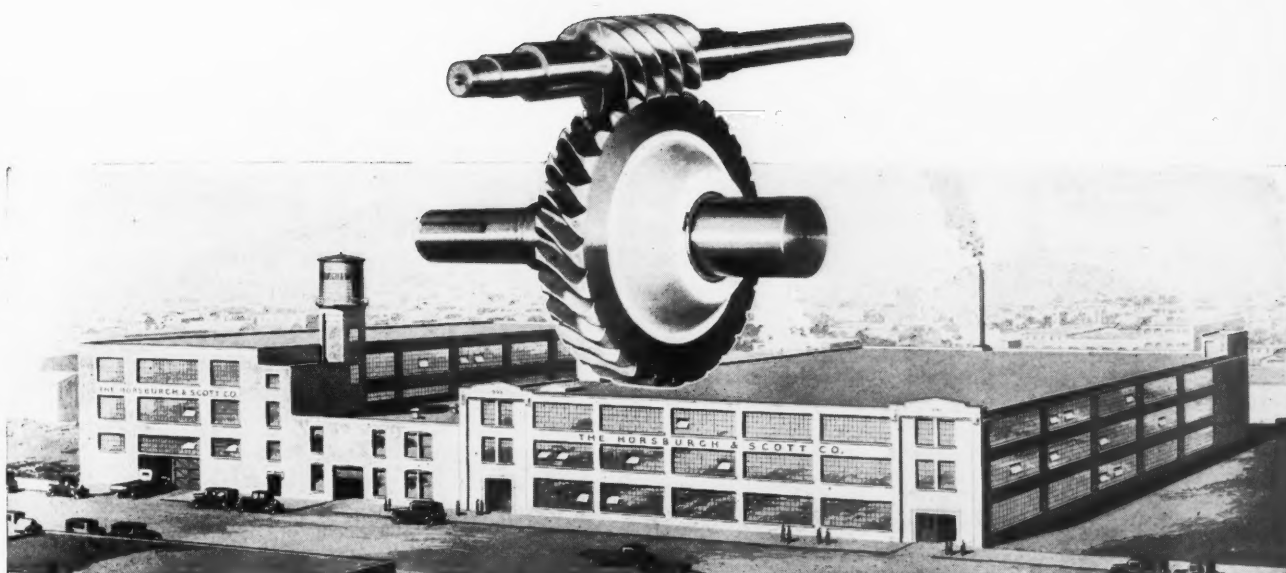


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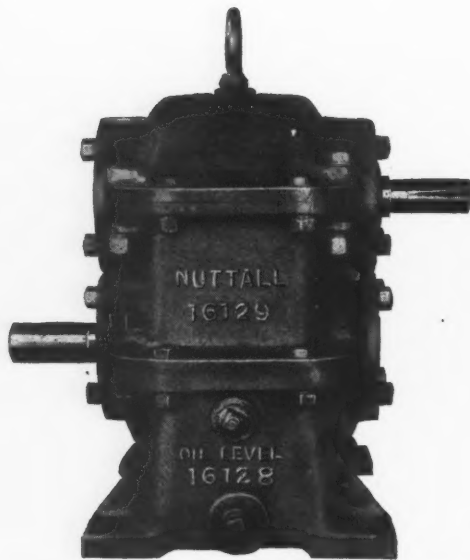
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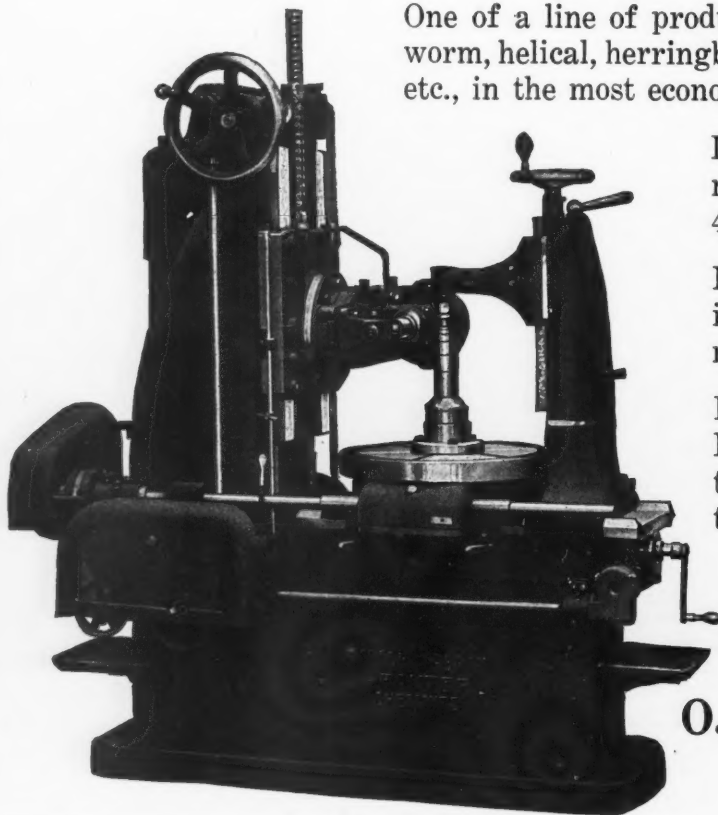
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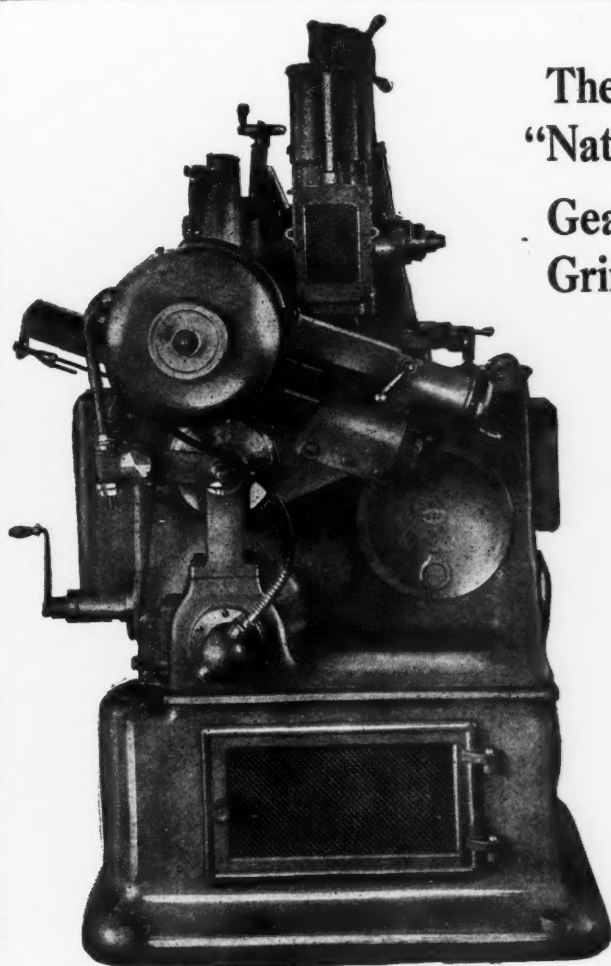
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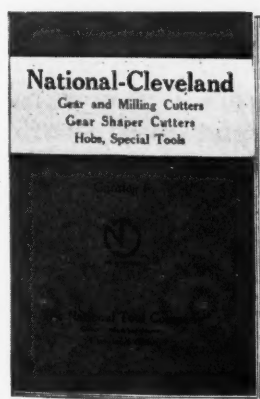


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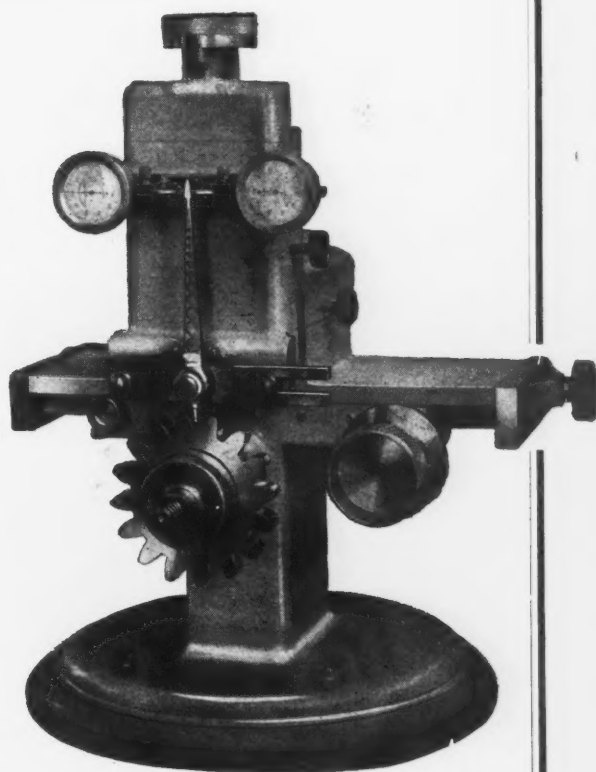
is an important contribution to the art of gear grinding. Nearly every mechanism depends on gears for its actuation, and perfection in gears means perfection in performance. The "National-Cleveland" Gear Tooth Grinder *Automatically* grinds each tooth to its final involute form — *accurate to 0.00005 inch in contour and 0.0001 inch for spacing.* A big feature outstanding in favor of production is that this accuracy is obtained though the gear blanks are not accurately roughed.



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Simmons Method

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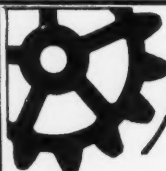


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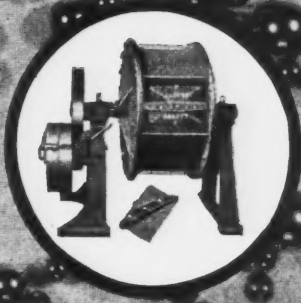
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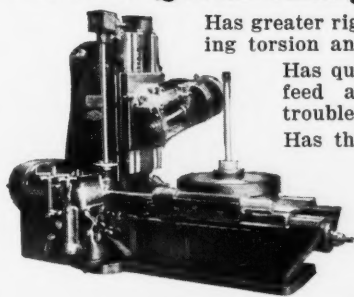
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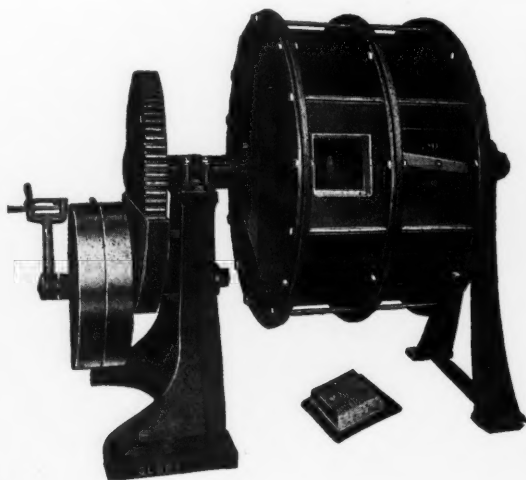
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THE proper lubrication of the machines you build depends largely upon the means you provide for it. Empress Grease and Oil Cups have done the job for years on all types of machinery—they will solve your lubrication problem. There is an Empress Cup for every need.

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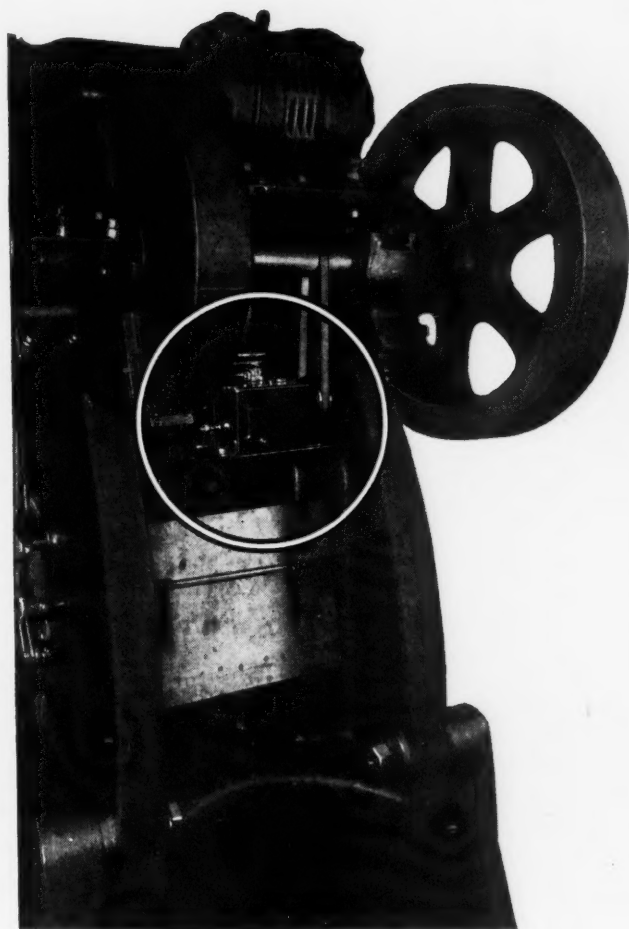
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Madison-Kipp Fresh Oil System Oils the Ram Slides and Bearings On this Punch Press



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On a punch press, the oiling of both the ram slides and bearings is a very important matter, due to the great weight of the moving parts.

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The Madison-Kipp Lubricator provides Fresh Oil in measured quantities to the slides and the bearings on the machine. It saves production time as it required from one-half to three-quarters of an hour twice a day to properly lubricate this press by hand.

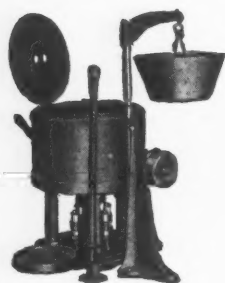
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Madison-Kipp Machine Tool Lubricators are produced to cover a wide range of requirements as to size, oil-feed adjustment, type and drive location. In many cases, they can be applied to machine tools now in use. We will be glad to furnish you with special data covering a wide variety of machines.

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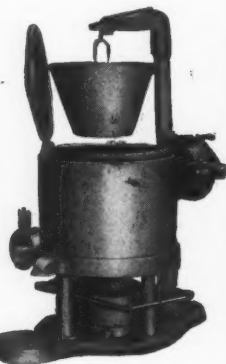
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Curtis Oil Extractors



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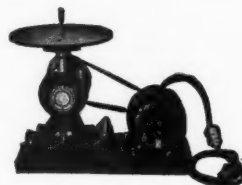
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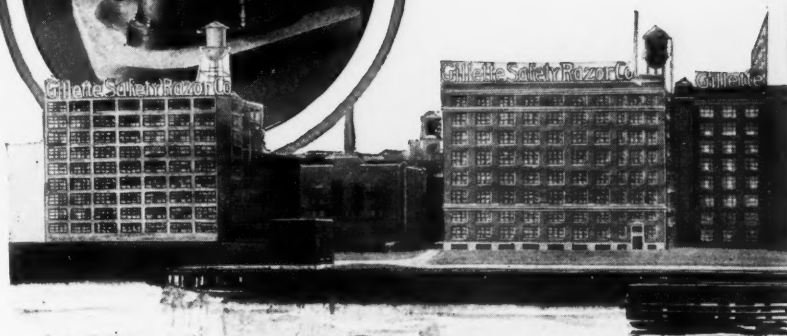
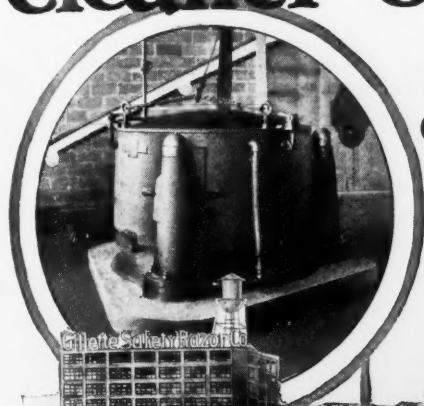
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TOLHURST MACHINE WORKS, Troy, N.Y.

Cleaner oil helps you get a cleaner shave



THE new screw machine department of the Gillette Safety Razor Company at Boston, Mass., is said to be the finest of its kind in America. Production slides through it as easily and smoothly as the Gillette itself slides over your face.—80,000 razors and 2,500,000 blades daily.

But here, as in every other screw machine department, production speed and quality depend largely on oil—just as the razor cuts better and faster when lubricated by a good lather.

Realizing this, the Gillette Company each week drains the sumps of its 80 Brown & Sharpe machines and refills with freshly purified oil. This, together with the fact that all make-up oil is thoroughly purified, keeps the oil in the pink of condition always.

Yet oil costs are low. A De Laval Chip Extractor centrifuges practically the last drop of oil from both chips and finished parts and—to borrow a slogan—De Laval Oil Purifiers make this recovered oil “good to the last drop.”

A similar system will work wonders in your screw machine department, too. Write for details, asking particularly for Bulletin 101-F.

De Laval Oil Purifiers in the plant of Gillette Safety Razor Company, Boston, Mass. Above at the left is shown a De Laval Chip Extractor used in connection with these machines at the same plant.

THERE are many other uses for De Laval Centrifugals in the metal-working industries. Ball bearing manufacturers, for example, are using them to reclaim the light flushing oil with which bearings are washed prior to packing and a more efficient job of washing at much lower cost is the result. Plants washing parts with soda water are reclaiming oil as well as the wash water itself from the bath. Other plants have found it profitable to establish rag laundries reclaiming both the oil which the rags have absorbed and the rags themselves.

De Laval engineers will be glad to make a survey of your plant for the purpose of helping oil become a profit maker rather than an expense.

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Centrifugals

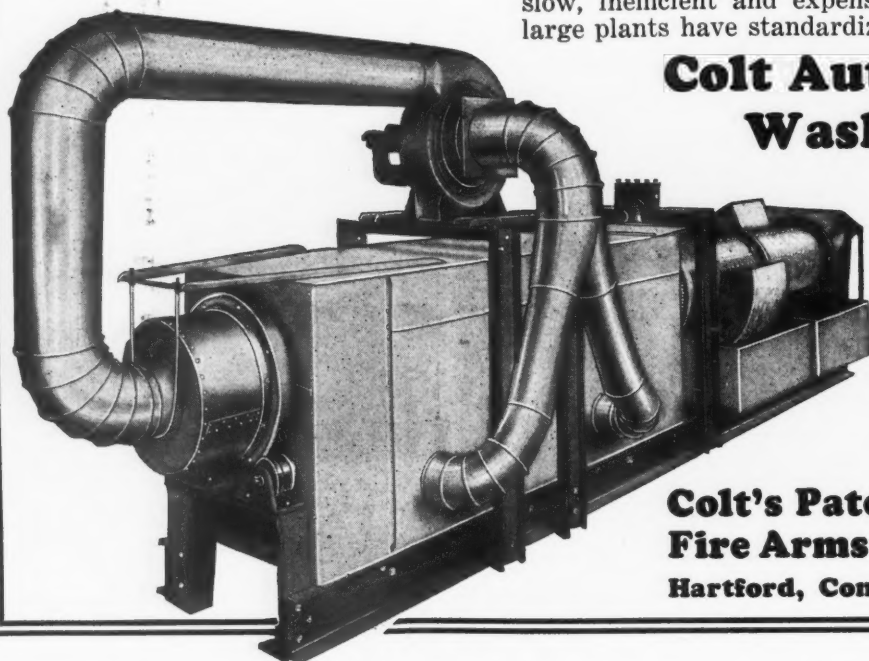
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**Clean Parts Mean
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Dirt, accumulating on parts in process, is a definite bar to production and low overhead. It increases the difficulty of handling and machining, and ruins expensive cutting tools. Hand cleaning methods being what they are—slow, inefficient and expensive—many of the country's large plants have standardized on

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Continuous, automatic and non-inflammable, these machines are from 25 to 75% cheaper to operate than any other washing machine. All details upon request.



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Fire Arms Mfg. Co.
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In sawmills, where sudden strains put babbitt metal to the acid test, Hoyt's Faultless "A" Babbitt has proven economical and enduring, wherever quality as fine as in Genuine "A" is not necessary. That is why Faultless "A" is so heartily recommended for similar machinery where sudden strain on the bearings is a factor.

Hoyt's Great Eight includes a Babbitt Metal for every purpose, made especially for that particular type of work. Send for your copy of "Babbitt Metal Data", a booklet which contains a wealth of valuable information. It is yours for the asking.

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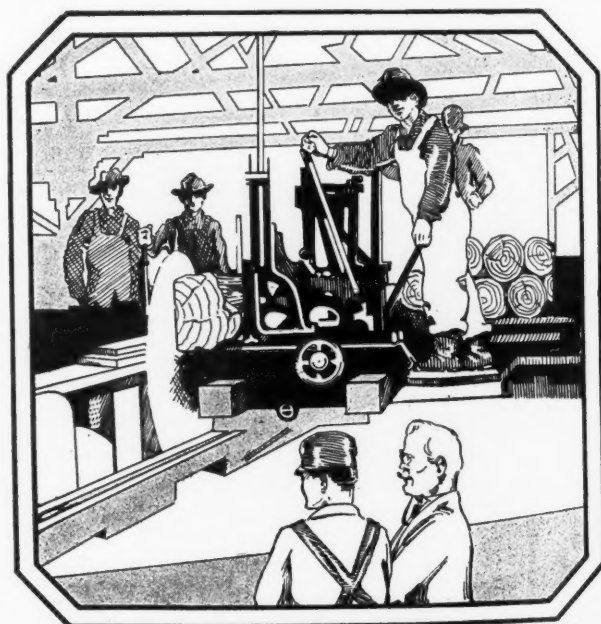


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720 R. P. M.

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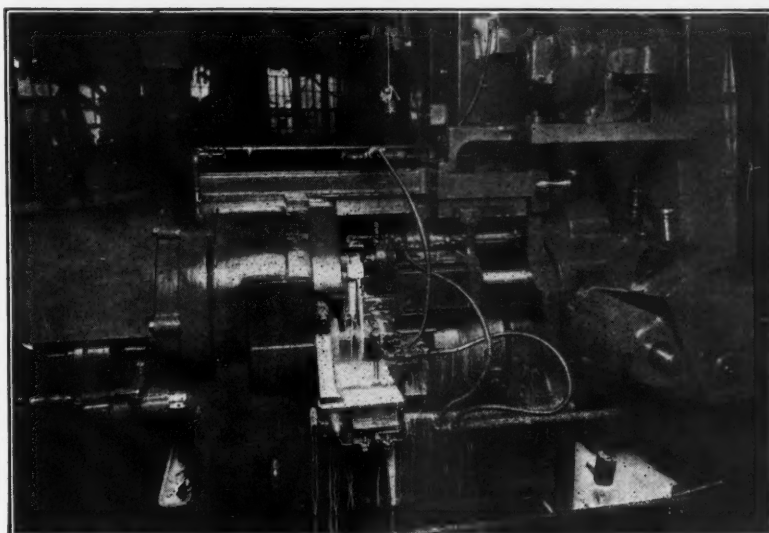
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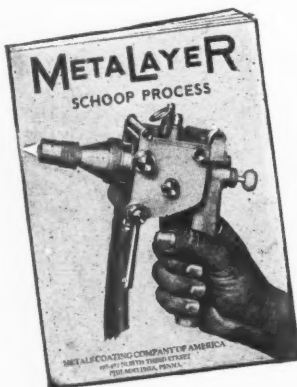


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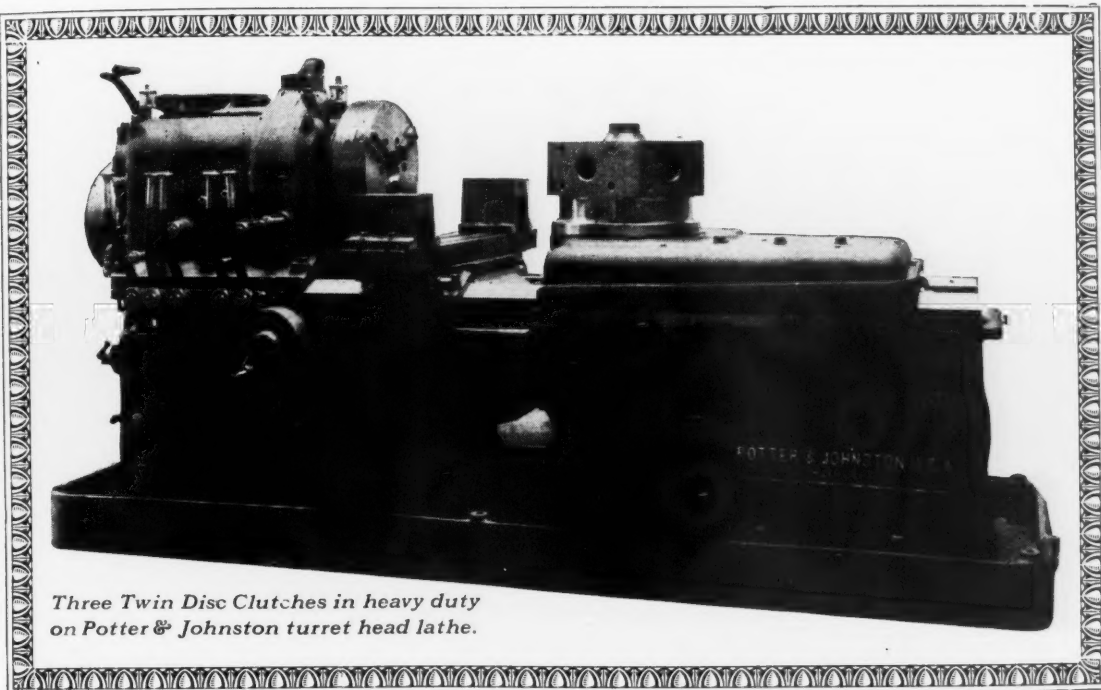
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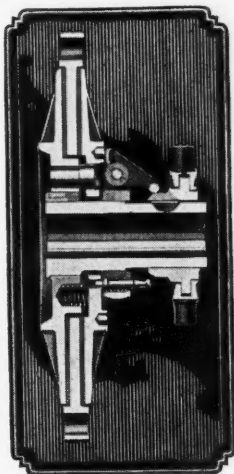
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Three Twin Disc Clutches in heavy duty on Potter & Johnston turret head lathe.



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Machine tools equipped with this over-capacity clutch start smoothly under load because the clutch can be slipped until the driven member attains full speed.

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TWIN DISC CLUTCH COMPANY

RACINE WISCONSIN

Shop Equipment News

Harrington Multiple-Spindle Drilling Machines with Oilgear Feed

THE Harrington Co., 17th and Calverly Sts., Philadelphia, Pa., has redesigned its vertical and horizontal multiple-spindle drills to include the Oilgear Feed. In the latter of this device the rack and gear, common to drills of this class, have been eliminated, and the drive is applied through balanced-force cylinders. The feed control pressure cylinders. The feed control of the vertical machine is obtained by means of either the foot pedal at the front of the machine or the control on the side of the machine. The horizontal machine is controlled by the foot lever at the through connecting foot columns at the front of the machine.

In the vertical type of machine the rack, hand, column, bracket, spindle, head, and gear chest are the same as for

the previous standard No. 63-B machine. The vertical machine, shown in Fig. 1, was designed especially for the drilling of the web in heavy structural beams and columns. The horizontal machine with two and four exposed heads, shown in Fig. 2, is used for drilling beam flanges at depth for drilling beam flanges at depth and columns up to 36 in. in diameter.

The improved features of the machines are the Oilgear feed for the feed control arrangement. On the vertical machine the Oilgear Oil pump and the driving motor, mounted on the rear of the machine, Two hydraulic cylinders are mounted on top of the feed control directly in line with the guide directly in line with any binding action of the drive in the motion.

In the piping from the pump numerous foot steps have been avoided by the use of bent pipes with the object of increasing the efficiency of the hydraulic transmission. The automatic feed is controlled by a system of three bellows, the operation of which is shown in Fig. 2, at the right-hand side of the machine and is capable of ready adjustment. The bellows control is had through the travel of the spindle head. The

return travel. The readings on the pressure gauge are claimed to give an accurate indication of the power feed pressure.

The machine shown in Fig. 1 has a maximum drill size of a circle maximum drill size of 2 1/2 in. in diameter, and a minimum center to center distance of positions of multiple spindles with 21 in. of "universal" universal joints. The spindle equipment consists of driving 1 1/2 in. drive shafts, universal joints, and structural steel. The spindles of each of four spindles is also furnished with this machine. These




Fig. 1—Feed control mechanism

The machine has a minimum center to center distance of 21 in. and is capable of driving drills up to 1 1/2 in. diameter. The automatic feed is controlled by a system of three bellows, the operation of which is shown in Fig. 2, at the right-hand side of the machine and is capable of ready adjustment. The bellows control is had through the travel of the spindle head. The

The machine is equipped with a 1/2-hp motor with convenient start-stop reset. The automatic feed control and dynamic friction clutch are mounted on the rear of the machine.

Mounted with motors as part of the tool, two 40 H.P. Morse Silent Chain Drives are used on these Harrington Horizontal Multiple-spindle Drilling Machines. Equipped with drip oilers that give constant lubrication to inside of chain, they require only regular filling of the oil cup.

The nearest Morse Transmission Engineer will gladly discuss your power drive problems with you.

Fig. 3—Harrington Multiple-Spindle Drilling Machine with Oliver Feed, Horizontal Feed

oil pump is arranged to distribute oil to all spindles and bearings in the heads. The control of the driving motors is by means of push buttons at the front of the machine convenient to the operator. In the horizontal machine the Oliver pump is heated at the rear conveniently accessible, but out of the line of interference of the work or of the operator.

Horizontal Duplex Machine

The rear end of the head on ball races. A collar on the spindle in the head provides for the taking of wear. Longitudinal travel of each head is made by a clamp race so that the head can be turned in the desired way to make the

The Oliver pump, as provided with these motors, consists of a constant-delivery, high-pressure pump for the rapid traverse, and a variable-delivery, high-pressure pump for the feed. The rate of feed is easily adjusted by means of two set screws on the pump, and the feed may be varied from 9 to 20 in. per min. The feed for the rapid traverse is 120 in. per minute.

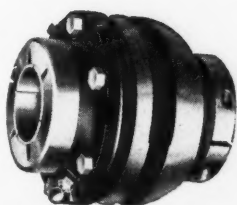
the head along the stationary feed screw to the desired position. The spindle assembly of alloy steel, 3 in. in diam., and are secured by a heavy nut, are provided with a No. 3 Morse taper. The spindle drive is through a spindle gear-driven sleeve, and in the case of the Oliver heads, the drive carries heavy keys in a slot in the spindle. The drive of the spindle taken directly from the main drive shaft through a train of gears made of hardened alloy steel of 10 to 12 diam. The other gears are of the spiral design, are mounted on Hystat rollers and are

The center of gravity is taken out on either side of the spindle additional weight for carrying the table which has two T-slots, is arranged as a regular part of the machine. Power feed in the head is provided through a heavy roller on the left through a heavy roller on the

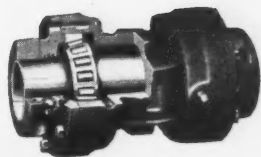
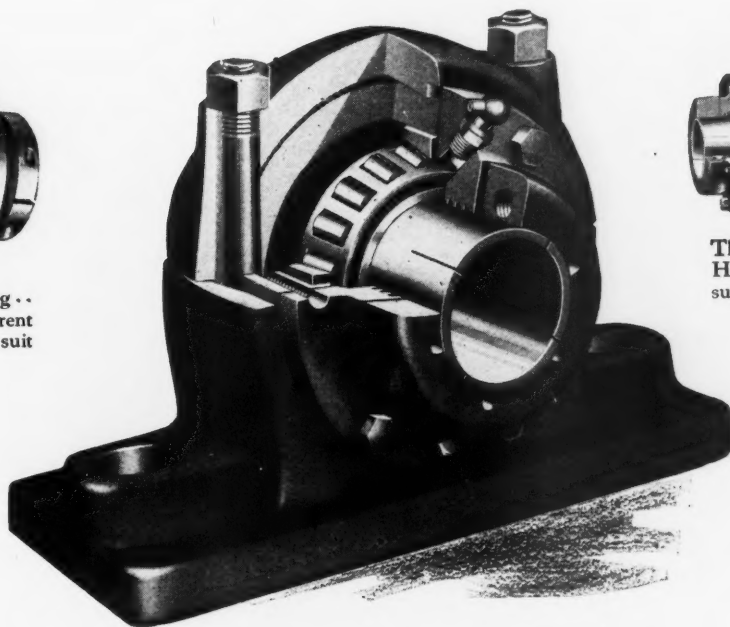
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210—MACHINERY. August, 1927

MEDART TIMKEN EQUIPPED LINE



The Unit Mounting . .
Furnished with different
types of housing to suit
various designs.



The Ball and Socket
Hanger Bearing . . for
support of line shafting.

The Pillow Block

**Saves Power . . Preserves Alignment . .
Eliminates Wear**

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This added Line makes Medart a more complete source for mechanical power transmitting machinery and allied products than at any time in its nearly 50 years of serving Industry. Ask for Bulletin on Timken-Equipped Line and for Catalog No. 43 on all other Transmitting Equipment.

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(Formerly Medart Patent Pulley Co.)

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Torrington, Conn., U.S.A.



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CONVENTIONAL DESIGN

FEDERAL RADIAL BALL BEARINGS possess the characteristics of conventional bearing design together with that inherent quality for which all Federal bearings are noted. These bearings are without filling slots. Only the very highest grade steel is used and every process of construction is accomplished with utmost care and precision.

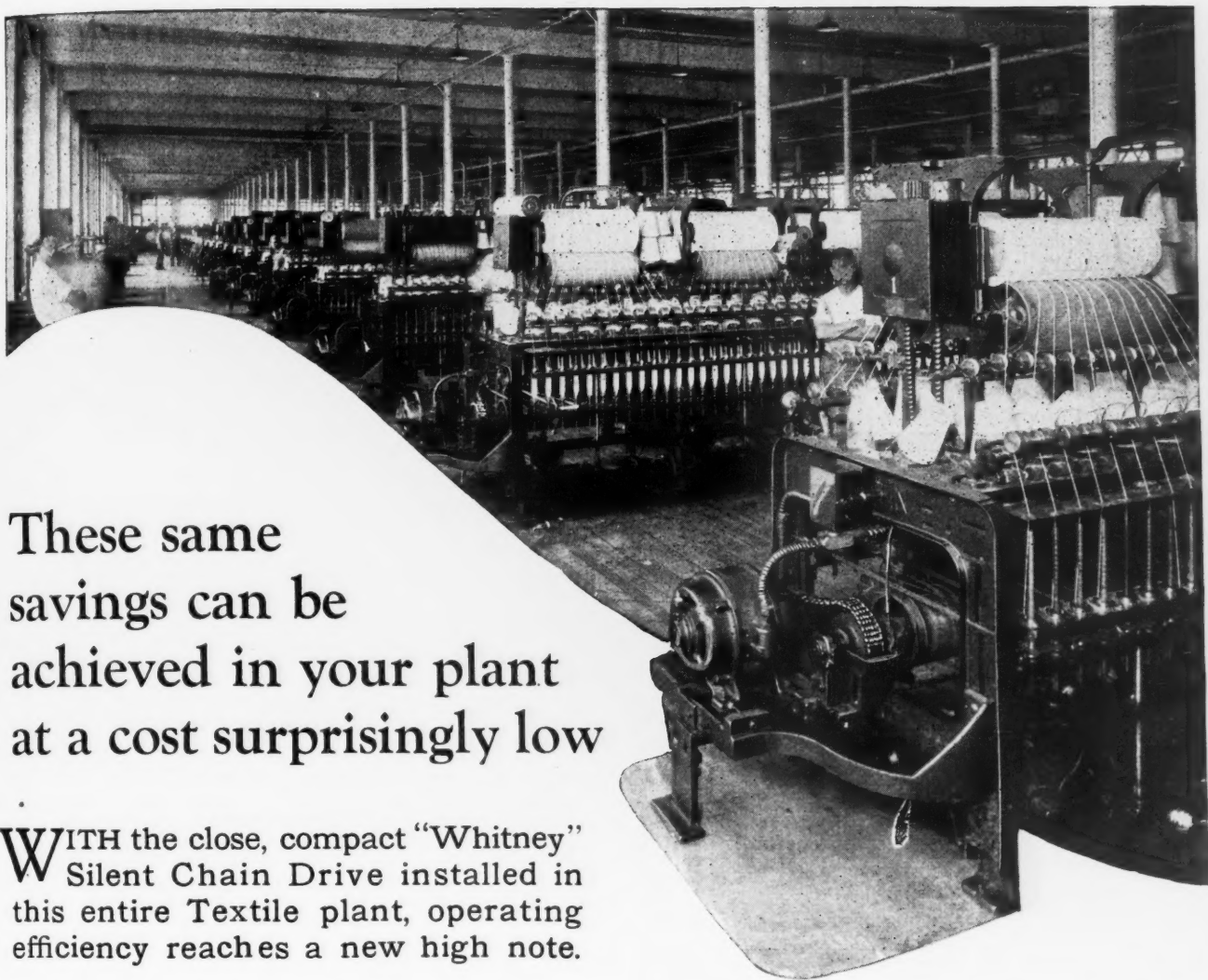
We shall be pleased to forward samples, quotations and complete information to those interested.

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WITH the close, compact "Whitney" Silent Chain Drive installed in this entire Textile plant, operating efficiency reaches a new high note.

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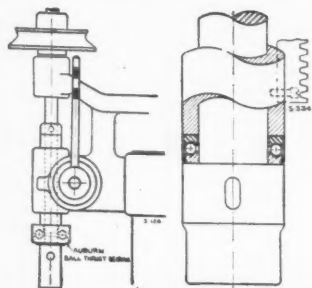
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A. H. Coates Co.
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DRILLING MACHINES equipped with AUBURN THRUSTS



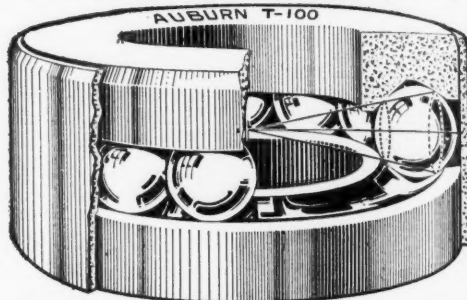
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The Small Sensitive Drill Press gives better service, and the Large Radial delivers more power to the drill point when the spindle thrust is cared for by an Auburn Ball Thrust.

Mail particulars of your drilling machine bearing problems and get the Auburn answer.

Steel, Brass and Bronze Balls

AUBURN BALL BEARING CO.,

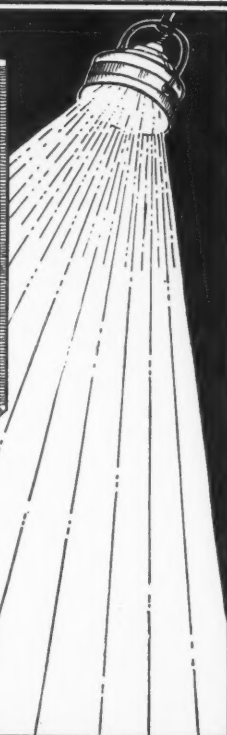


33 Elizabeth St., Rochester, N. Y.

"QUALITY IS MAKING US FAMOUS"

Buckeye Bearings, Bushings, Bronze Bars insure better, longer machine service, reduce maintenance costs.

Send for our
"SERVICE STOCK"
List of Finished Bushings



The BUCKEYE BRASS & MFG. CO.
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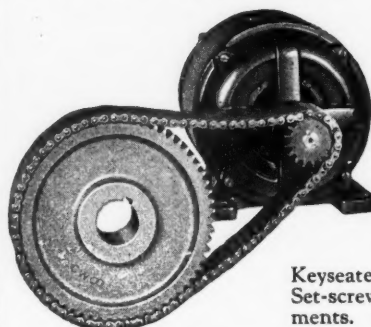
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Electric Motor Drives
 $\frac{1}{2}$ H.P. to 10 H.P.

Reduction Ratio
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Whitney High Speed
Silent Chains on hand.
Driving Sprockets of
Steel, Heat-treated and
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Cast Iron; Rebores,

Keyseated and provided with
Set-screws to suit your require-
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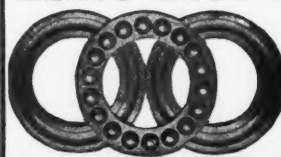
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STANDARD DIMENSIONS
or to ORDER, up to 12" Shaft Dia.
ONE OR ONE THOUSAND

The Gwilliam Company

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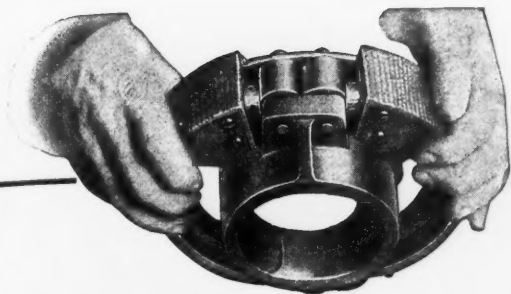
THRUST BALL BEARINGS
For Machines of All Types
BEARINGS CO. OF AMERICA
DETROIT, MICH. OFFICE 1012 FORD BLDG. LANCASTER, PA. U.S.A.



Let Us Design a Clutch for You

We recently designed a successful clutch for a machinery manufacturer making a product that is short-lived and cheap. The clutch had to be low in price—yet efficient. For another concern we have designed a clutch embodying every workable refinement, price being no object. And we have designed suitable clutches for all sorts of applications between these extremes for twenty years. May we quote?

THE HILLIARD CORPORATION, Elmira, N. Y.

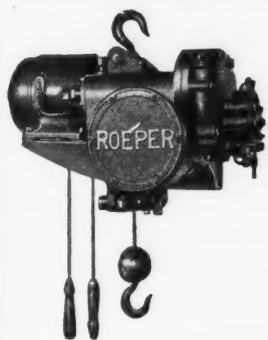


**Powerful
and Easy
to Operate**

Two anti-friction rolls moving over hardened tool steel surfaces exert a heavy pressure on the friction shoes of Mule Pull Clutches—they engage powerfully and positively, and release quickly and easily. All parts of Mule Pull Clutches are simple and rugged—unfailing lubrication keeps them in perfect order with little or no attention. Clutch troubles are practically unknown where Mule Pull Clutches are used.

Send for Details and Prices

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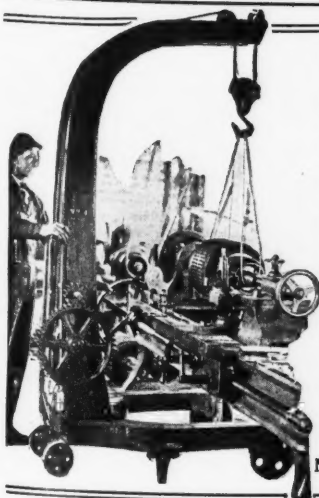


Lift Electrically

Why pull—tug—strain and waste your time with slow lifting methods when the ROEPER TYPE "R" Electric Hoist will do the work twenty times as fast?

The price is surprisingly low. Send for Bulletin.

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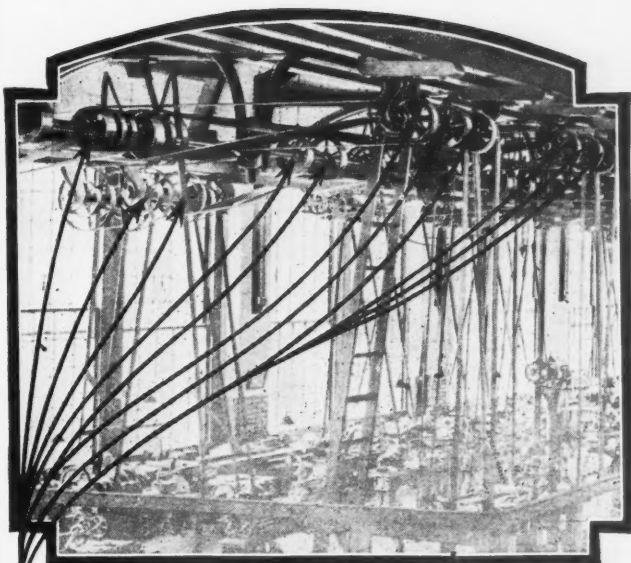
Setting Up

heavy work on the machine, moving it from one machine to another, is greatly simplified by the use of a CANTON PORTABLE FLOOR CRANE. Carrying capacity to 6000 pounds; one man operation; low base that slides under machine beds and Safety Friction Load Brake which holds the load at any point: These are a few Canton advantages.

The new Safety Friction Load Brake may be installed on old model cranes; send for details.

Canton Foundry & Machine Co.
CANTON, OHIO

New York Office, 203 E. 15th St.



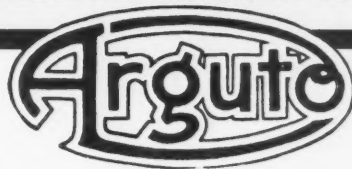
"Yes, sir—those Arguto Bearings have been on those countershafts almost as long as I can remember. We've never touched them—never given them a drop of oil. I guess they'll be there after we're gone."

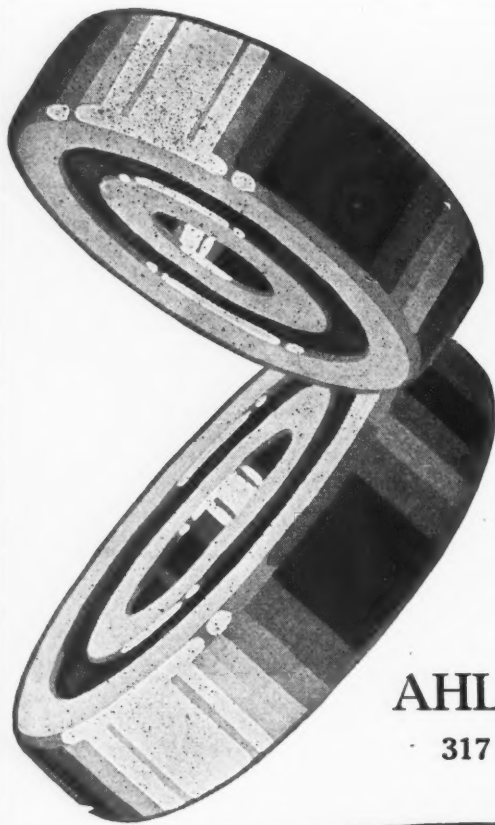
"Somebody told me the other day about an Arguto Bearing which had run for twenty-two years with no sign of wear to shaft or bearing. Some record, but I guess ours will match it!"

Are YOU interested in bearings that will give such service? Write us.

ARGUTO OILLESS BEARING CO.
Wayne Junction, Philadelphia, Pa.

OILLESS BEARINGS





"MASTER"

BALL BEARINGS

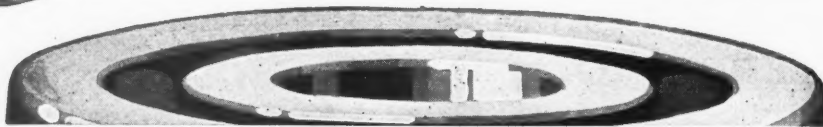
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317 East 29th Street

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Branches in Thirty-three Cities



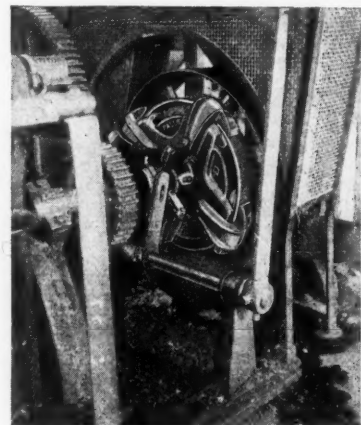
Obtain Clutch Satisfaction \equiv with FALLS \equiv CLUTCHES

For ordinary power transmission with a steady, continuous load—for installations where the load is intermittent and severe—for machines with a starting torque greatly in excess of the running torque—for all speeds—in fact, for almost every individual requirement there is a Falls Clutch that will render the most satisfactory service.

Of simple, yet sturdy construction, Falls Friction Clutches provide a powerful, easily erected mechanism that gives lasting, dependable performance.

Specify Falls Clutches. Handbook 17 G, in addition to being a valuable treatise, describes the complete line in detail. Send for your copy.

Falls also manufactures a complete line of Power Transmission Machinery and maintains a staff of capable engineers ever ready to solve your particular problem. Handbook 18 covers the complete line.



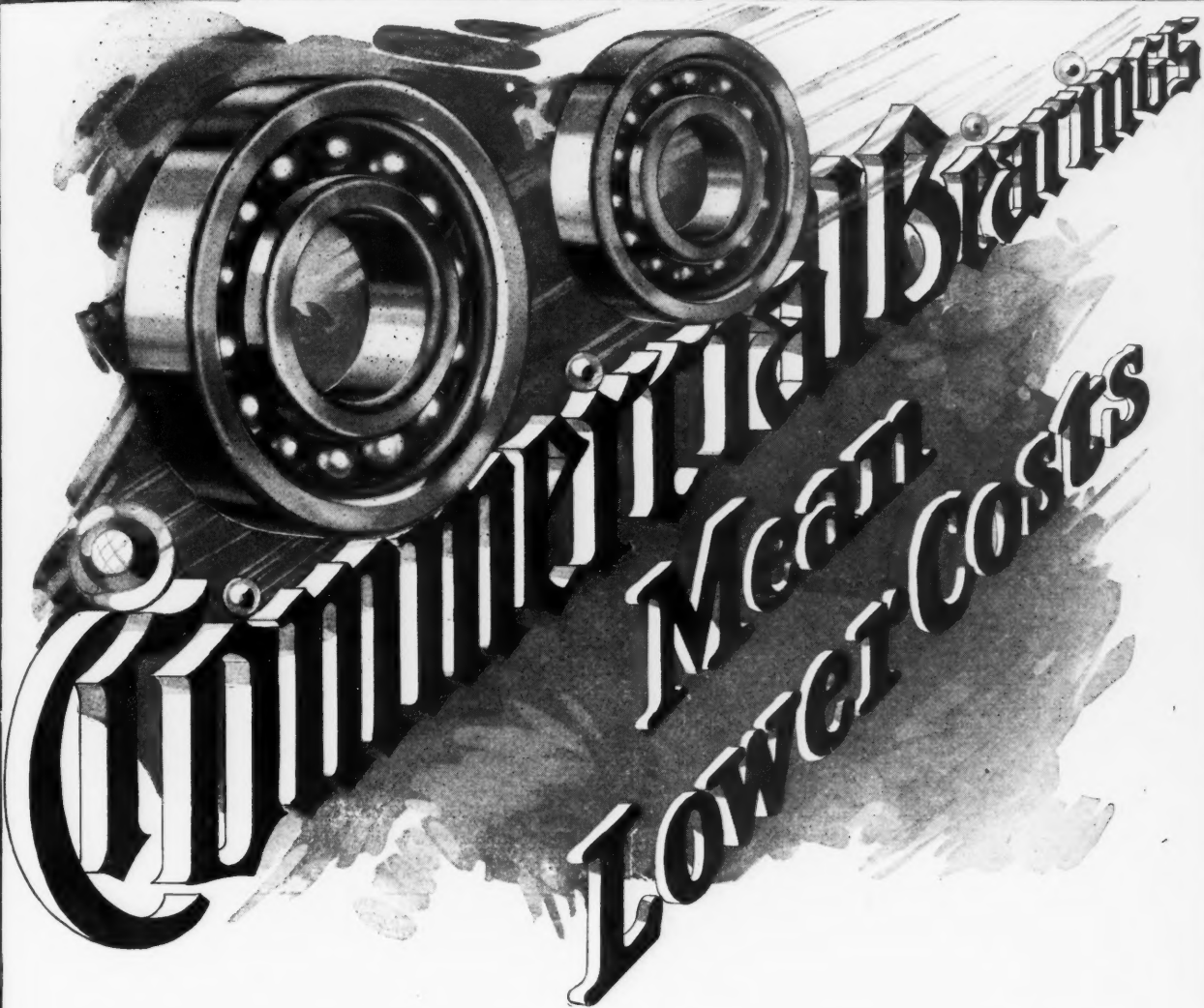
Falls Clutches stand up and give continuous, efficient service despite adverse conditions under which they may have to work. The Falls Clutch, pictured above, has dirt and grease to contend with, yet it continues to render satisfactory service.

The FALLS CLUTCH & MACHINERY CO. \equiv KENT, OHIO

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206-208 Fulton St.

CHICAGO
625 Monadnock Block.

BOSTON
52-58 Purchase St.

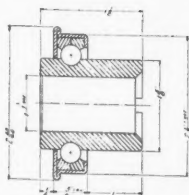


AND lower costs bring greater profits. If you use bearings in the product you make, get quotations and facts concerning "Commercial" Annular Ball Bearings. They are adaptable to a wide variety of uses. Here is a bearing that meets every requirement at a price that is interesting.

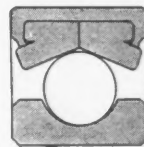
"**C**OMMERCIAL" Annular Ball Bearings have the famous three-point contact and are made with great care and precision. They are free-running. Speeds up to 2500 R.P.M. Three-point contact permits a large number of balls and a combination radial and thrust load, with thrust in either direction.



A TYPICAL INSTALLATION



CS 833 is an unground bearing for use on wheels of mine cars, etc., having three inch thick hub. Abutting ends of inner ring permit passage of lubricant from drilled shaft. Made in many other sizes.



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THE SCHATZ MANUFACTURING COMPANY, Poughkeepsie, New York



Improving Power Transmission

**That's what Every Engineer
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Ramsey
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Ramsey Silent Chain is a better power transmission element and because of superior performance and economy has a strong appeal to both shop man and production executive. A unique principle in joint structure provides smoother running, quieter operation and longer life.

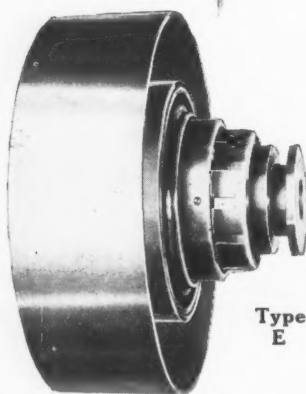
The Textbook-Catalog describes fully the marked advantages of Ramsey Silent Chain. Let us send it.



Get Your Copy

A Good Argument

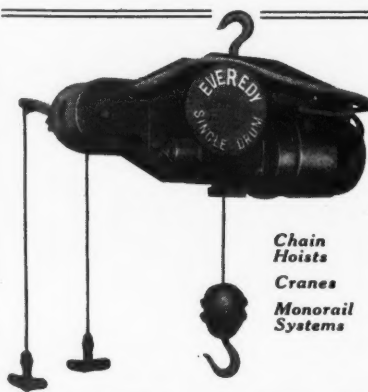
An Edgemont Clutch always adds to the selling argument for a machine—in the first place, the Edgemont reputation guarantees the clutch; in the second, the assurance of quality in such an important part adds to the confidence of both buyer and seller. Edgemont Clutches are made for all types of service; cut shows the Edgemont type E Disc Clutch.



Type
E

Edgemont Clutches
Clutch Pulleys
Cut-Off Couplings
Extended Sleeve
Clutches and Special
Clutches for all Pur-
poses—described in
Catalog "H".

The Edgemont Machine Co.
2700 National Avenue DAYTON, OHIO, U. S. A.



Chain
Hoists
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EVEREDY Electric Hoist

The hoist weighs 225 pounds, lifts 500 pounds and costs \$225.00; it is fast, convenient and like all "Reading" equipment, durable.

Send for details of this and larger size hoists; ask also about other Reading equipment.

READING CHAIN & BLOCK CORP.
READING, PA.

**1885
1,000
in use**

MOORE & WHITE FRICTION CLUTCHES

Gluttons for punishment. The harder you work them the better they like it. Try one and be convinced.

Catalog "M" Free

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Uniform in
Quality
"AMERICAN"
Pulleys and Hangers
and

UTICA Sheets and Pillow Cases
REG. U. S. PAT. OFF.



THE experience of uniform quality and long wear has made Utica Sheets and Pillow Cases favorably known to millions of women.

This steadfast quality is the fruit of manufacturing skill and the most efficient equipment.

Included in this equipment are "American" Steel Split Pulleys and "American" Pressed Steel Beam Heads. Their selection by the makers of Utica Sheets must rest upon these same fundamentals of uniform quality, long life, skilled workmanship and sound construction.

The millions of "American" Pulleys, Hangers and other pressed steel products serving the industrial world, are evidence that this name, too, is favorably known through experience to thousands of mills and factories in this and virtually every other country where manufacturing is carried on.

The features which make "American" Pulleys and Hangers so efficient are described in special folders. Have your secretary write for these.

THE AMERICAN PULLEY COMPANY

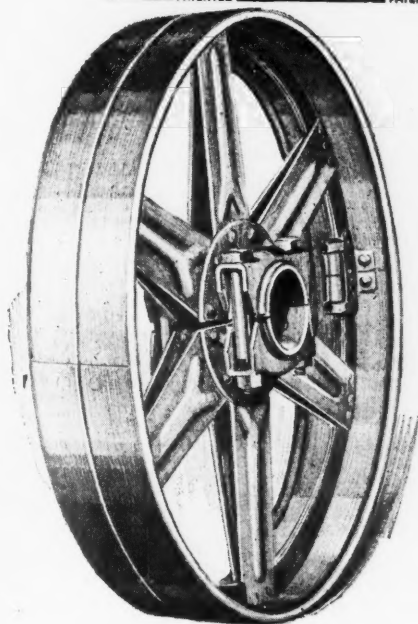
Manufacturers of Steel Split Transmission Pulleys, Pressed Steel Shaft Hangers, Pressed Steel Hand Trucks and Pressed Steel Shapes

4200 Wissahickon Ave.

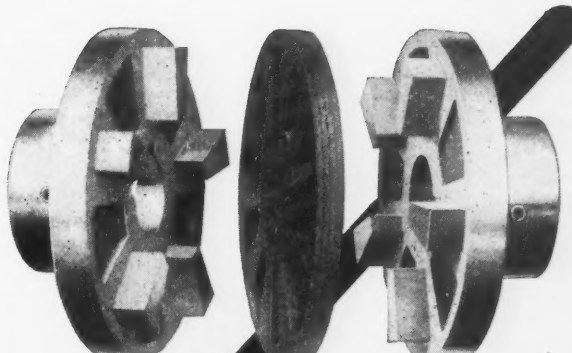
Philadelphia

For nearest distributors see MacRae's Blue Book

AMERICAN
PRESSED STEEL | STEEL SPLIT
HANGERS | PULLEYS
PATENTED PATENTED



Strength, with light weight, is a characteristic of both "American" Pulleys and "American" Shaft Hangers. Both are efficient tools of power transmission and because of their convenience and trim, graceful lines, both are distinctly in harmony with modern shop practice.



Wood's

FLEXIBLE COUPLINGS



*Absorbs Destructive Strains
Like a Sponge Absorbs Water*

WHEN direct-connecting your motor to its load, the simple precaution of using Wood's Flexible Couplings will save you many dollars in repairs and add years of life to your equipment.

These couplings protect both ends of your equipment—the motor and the machinery it drives by absorbing the destructive vibration set up by the intermittently loaded machinery and the resulting power surges of the motor.

Note the construction of Wood's Flexible Couplings shown above, consisting of two cast iron flanges with lugs cast integral and a multi-ply specially constructed leather disc.

It is this disc that absorbs all the punishment saving your motor and machinery all wear and tear.

Only in Wood's Flexible Couplings do you get Wood's dependability.

T. B. Wood's Sons Company
Chambersburg, Penna.

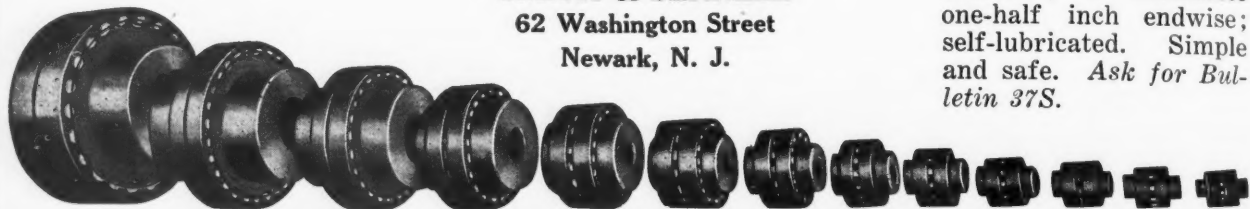
Write for Descriptive Catalog

**All Metal, Durable
Any Power, Speed
or Service.**

FRANCKE
FLEXIBLE COUPLINGS

For Motor, Turbine, Engine Drives

SMITH & SERRELL
62 Washington Street
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**The Improved
Bush Pin Type**

handles all accidental shaft misalignments; cushions shocks and vibrations; is extensible one-half inch endwise; self-lubricated. Simple and safe. Ask for Bulletin 37S.

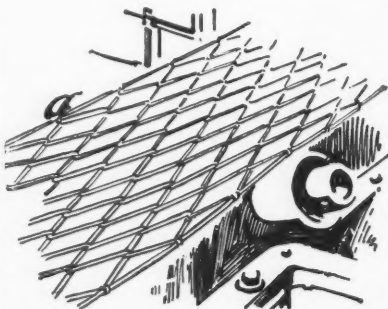
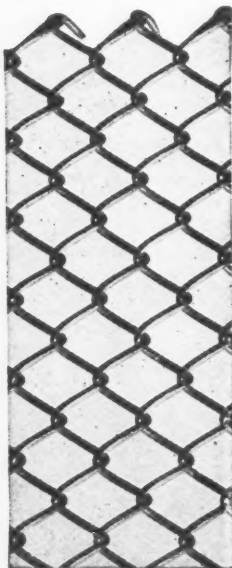
The New Way to Convey

The growing popularity of Flexible Wire Conveyor Belting is in keeping with industry's perpetual effort to conserve time and labor. Costing less initially than cloth and leather materials, it possesses greater wearing qualities and is easier, faster and cheaper to repair when a break eventually does come.

Flexible Wire Belting comes in varying meshes for conveying everything from sand to machine parts. It can be passed through any kind of a heat-treating or acid process without injury, and it does not kink or buckle.

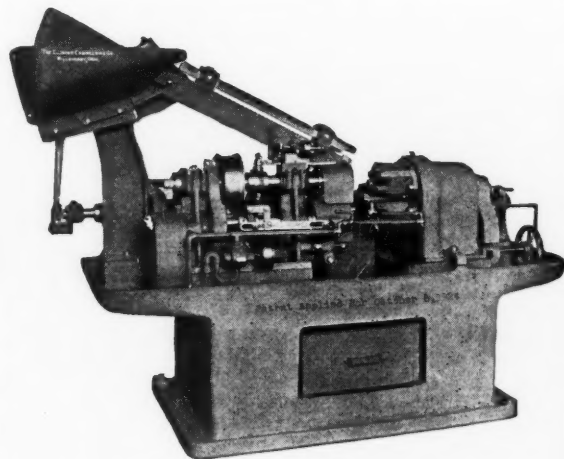
*Further particulars on
receipt of request.*

Industrial Conveyor Co.
1085 Broad St. Newark, N. J.
Factory—Keyport, N. J.



Economy Combined Automatic Pointing and Threading Machines

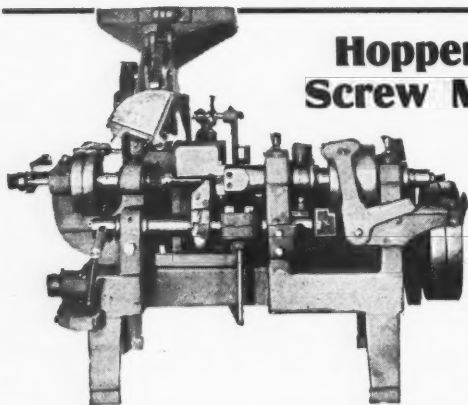
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1" Machine—Capacity $\frac{1}{2}$ " to 1" dia., $1\frac{1}{4}$ " to $5\frac{1}{2}$ " long.
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 $\frac{9}{16}$ " Machine—Capacity $\frac{1}{4}$ " to $\frac{9}{16}$ " dia., $1\frac{1}{4}$ " to $4\frac{1}{2}$ " long.
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SCREENS OF ALL KINDS

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Tel. Canal 1439
Perforated Metal Machinery Guards

Saving Time to Save Money—

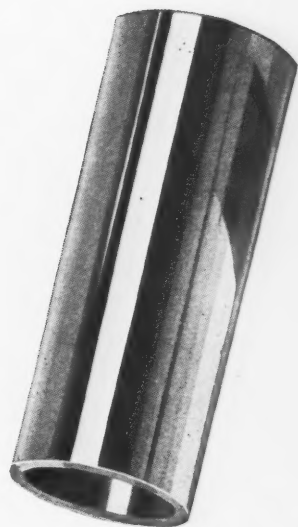


Time-saving methods are no less essential than time-saving machinery in the problem of eliminating waste and cutting production costs. . . . As a consequence, the use of the purchase order has come into popular favor in supplying requirements of bronze bushings and bearings. . . . Here are parts which are demonstrably lower in cost when bought from the specialized maker. . . . And as a time-saving method it is being adopted rapidly by machine manufacturers and those industrialists whom they serve. . . . In many instances a *Johnsoneer has been of substantial assistance in helping to prove the merits of the method. . . .

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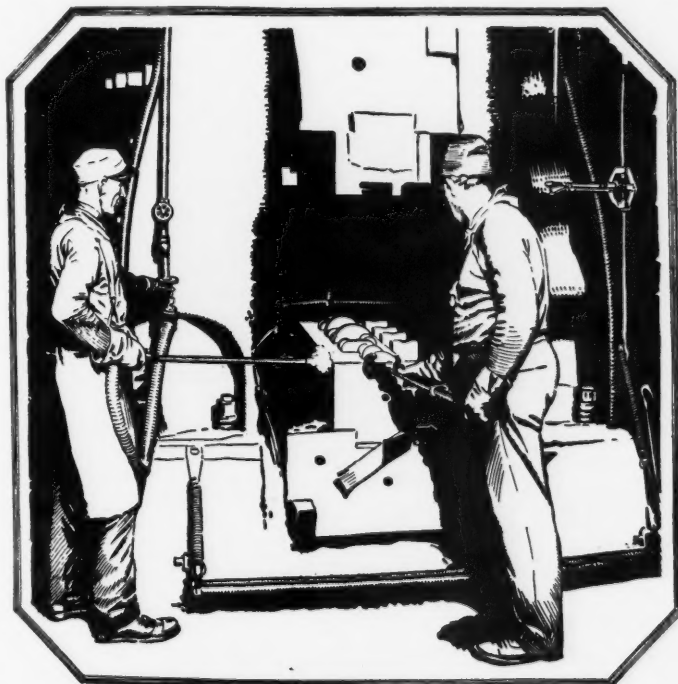
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QUALITY BRONZE
BUSHINGS

Warehouses at
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**The Johnsoneer is a technically trained man in matters pertaining to high speed machines and their economical operation. He will be glad to consult with the master mechanic or maintenance supervisor to help solve bushing and bearing problems efficiently and economically. And his services are at your disposal without obligation.*

We are equipped to supply your drop-forging needs



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SUPERIOR DROP-FORGINGS

**SUPERIOR
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INCORPORATED 1894

Addison Road and Lake Shore R. R. Tracks
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POORMAN

Headquarters for
Small Parts Up to
3½ ins. Diameter

*Send
for
Estimate*



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Poorman Small Parts are the product of specialists, and shrewd manufacturers appreciate the advantage of using them. They are cheaper than if made in their own shops, better made, more accurate and longer wearing. And they are delivered on time, true to specifications in every detail.

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We can promptly supply forgings of all kinds, any size up to two tons—plain or heat treated; rough machined to your specifications if desired.

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Dyson & Sons**
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Every Plant Uses Hollow Bored Forgings

Those who know, say that American Hollow Bored Forgings are right in quality and price for Lathe Spindles, Rams, Clutch Shafts, Piston Rods and such important machine parts.

Ask us about prices and deliveries on your work; send blue prints or drawings.

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keep materials and processes
up to a high standard.*

Die castings of consistent high quality by scientific control

AT The Stewart Die Casting Corporation the preparation of alloys and the conduct of die casting processes are governed by scientific control. A staff of competent chemists and metallurgists carry on analyses, compound alloys and keep accurate control of working temperatures. Metallurgists fit the proper alloy to the product. None but best quality virgin metals, analyzed to check their purity, are used in the composition of alloys. After being compounded the alloys are rechecked by analysis. They are then held for the chemists' approval before release to the die casting machines.

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(Formerly Stewart Manufacturing Corporation)

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M8-Gray



J & J Sound Forgings which Save Money

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Cost no more than any good forging—send your prints for a quotation.

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Addison Road and Lake Shore R. R. Tracks
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POORMAN

Headquarters for
Small Parts Up to
3 1/2 ins. Diameter

Send
for
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Every Plant Uses Hollow Bored Forgings

Those who know, say that American Hollow Bored Forgings are right in quality and price for Lathe Spindles, Rams, Clutch Shafts, Piston Rods and such important machine parts.

Ask us about prices and deliveries on your work; send blue prints or drawings.

AMERICAN HOLLOW BORING COMPANY
1035 West Nineteenth Street, Erie, Pa.



The Stewart laboratories keep materials and processes up to a high standard.

Die castings of consistent high quality by scientific control

AT The Stewart Die Casting Corporation the preparation of alloys and the conduct of die casting processes are governed by scientific control. A staff of competent chemists and metallurgists carry on analyses, compound alloys and keep accurate control of working temperatures. Metallurgists fit the proper alloy to the product. None but best quality virgin metals, analyzed to check their purity, are used in the composition of alloys. After being compounded the alloys are rechecked by analysis. They are then held for the chemists' approval before release to the die casting machines.

The Stewart engineering staff is often able, through experience, to adapt products to the Stewart pro-

cess by modification of design and, in so doing, improve the product and greatly reduce the cost of production. These engineers design the dies which are made in a thoroughly modern, completely equipped and well manned tool room. Dies are made here by the most competent workmen obtainable, at a cost that is extremely moderate.

As assurance that no imperfect castings will be passed, a specially trained inspection department keeps pace with production. Imperfections in casting or finishing are quickly eliminated.

Full information on the application of the Stewart process to your product will follow your inquiry.

THE STEWART DIE CASTING CORPORATION

(Formerly Stewart Manufacturing Corporation)

4500 Fullerton Avenue, Chicago, Illinois

Direct Factory
Representatives in
Detroit Milwaukee
Cleveland Los Angeles
San Francisco
New York City
Birmingham Pittsburgh
Indianapolis St. Louis



M8-Gray

What is the Difference between Profit and Loss?

Very often but a matter of a few dollars—our charge for speeding up or eliminating an operation, designing and constructing a special machine or a set of workable fixtures for a balky job. Insignificant enough, compared to the results.

We've been doing this for over 21 years and know how—we haven't failed yet! Our clients represent various lines of manufacture. We have the equipment, mental and mechanical, equal to any task. Let our engineers tell you all about it. Write—

The Columbus Die, Tool & Machine Company

Columbus, Ohio, U. S. A.



Machine Babbitt Casting

The M. C. E. Centrifugal Babbitting Machine successfully casts bearings in connecting rods and similarly shaped parts—at a greatly diminished cost per bearing. Production varies with the rate at which the metal cools, and the skill of the operator—75 bearings $2\frac{1}{8}$ " bore by $1\frac{9}{16}$ " long were turned out in *one hour*.

The M. C. E. Babbitting Machine is ruggedly built and extremely easy to operate, and the bearings produced are of high quality, sound, free from blow holes and impurities.

Let us send you complete details.

**Production
Engineering—
Consulting—
Designing**

O. C. Kavle, L. W. Moulton and Staff of
Associate Engineers and Designers—
Known as

Manufacturers' Consulting Engineers

McCarthy Building, SYRACUSE, N. Y.



**HIGH GRADE
JIGS, FIXTURES, DIES, GAGES
AND SPECIAL MACHINES**

SEND FOR FREE ILLUSTRATED PROSPECTUS
MEHL MACHINE TOOL & DIE CO.

Established 1913
30 Minutes from New York City ROSELLE, NEW JERSEY

WE SPECIALIZE

on tools that incorporate the Five Fundamental Tool Virtues. As a result we offer to make for you:
Tools that are time saving. Tools that are foolproof. Tools that are easy to manipulate. Tools that will give largest possible production. Tools that will give absolute interchangeability.

Send us your blueprints and specifications. We specialize in difficult toolwork such as the average toolroom has difficulty in handling. Will gladly furnish estimate and will make prompt delivery.

PRECISION ENGINEERING COMPANY
(formerly Arthur Brock Tool & Mfg. Works, Inc.)
533 North 11th Street, Philadelphia, Pa.

S & D

Greater Ability to Serve You

More shop space—added facilities enable us to build parts, machines and equipment better and at lower cost than ever. Let us quote on your requirements.

Sweet & Doyle Foundry & Machine Co.
TROY (Green Island) NEW YORK

BACKED BY 35 YRS.

FRANKLIN DIE-CASTINGS

EXPERIENCE

A Dependable Source of Supply

In 1892 Franklin Engineers originated the die-casting process. For 35 years Franklin Castings have helped manufacturers to simplify and speed production in many fields of industry. Manufacturers of home appliances are only one of the many that have found Franklin castings the direct way to results.

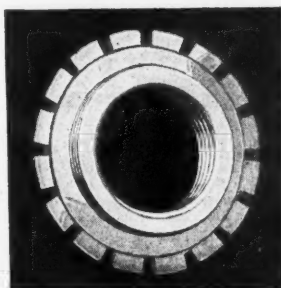
*Quotations on receipt of
samples or blue prints*

FRANKLIN DIE-CASTING CORP.
Syracuse, N. Y.



FRANKLIN DIE-CASTINGS IN MODERN INVENTIONS

Better
Methods



Better
Die
Castings



SuperCast
since
1919

The Superior Die Casting Co.
Cleveland, Ohio

DIE-CASTINGS

Standard Alloys

Send us blueprints or models

Republic Die Casting Company, Inc.
128 Mott Street NEW YORK CITY

Sterling
DIE CASTINGS

Die Castings in Aluminum, Zinc, Tin and Lead Alloys
If You Value Quick Action and Real Cooperation, Let Us Quote.
DEPENDABLE DELIVERIES
STERLING DIE CASTING CO., Inc., 749 39th St., Brooklyn, N. Y.

Why Procrastinate?

TIME flies, so does money lost by using obsolete methods and equipment.

By intelligent engineering we stand ready to increase your production, thereby reducing your cost to its lowest level.

With us the first cost is the only cost.

Our specialty is designing complete ultra-cost-reducing tool equipment—special automatic labor saving machinery that is a real labor saver; also assembly planning, time study and efficiency work, in fact, engineering in all its branches.

A staff of highly specialized engineers, and a well trained drafting force are at your disposal.

Write us today.

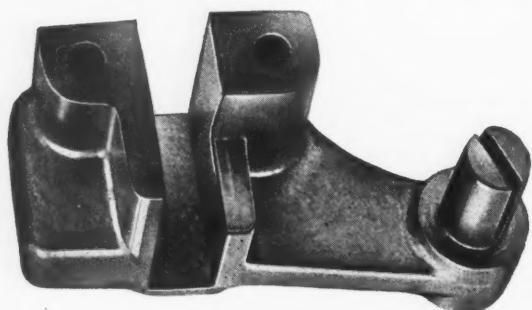
RELiance DIE & STAMPING CO.

*Engineers and Builders of High Grade Tools,
Dies and Special Automatic Machinery.*

501-511 N. LaSalle St.

CHICAGO, ILL.

This Casting is Made of McGILL METAL



and was produced by pouring liquid McGill Metal into a permanent steel mould. Despite the intricacy of its pattern and the fact that it is accurate to .004", it required practically no finishing operations.

Not only does the McGill promote worthwhile savings in equipment, labor, time, power and material, but it produces a casting as strong as steel, yet lighter, malleable, ductile and non-corrosive. Send blue-prints for interesting estimates.

Physical Properties

Tensile Strength.....	75,000 lbs.
Compressive Strength.....	120,000 lbs.
Elongation.....	18 to 20%
Elastic Limit.....	30,000 lbs.
Hardness, Rockwell B Scale.....	75-80
Hardness, Brinell.....	130

McGILL METAL COMPANY
VALPARAISO, INDIANA

DEPEND ON ALEMITE die-castings

Die-castings made from aluminum,
zinc, tin and lead base alloys.

Send sample or blueprint for quotation.

ALEMITE DIE-CASTING & MFG. CO.
2642 Belmont Ave. Chicago, Ill.

Cornine-Hakanson Die-Casting Co., Inc.
402 East 152nd Street, New York City
Phone Melrose, 10125

Alloys in Aluminum, Tin, Zinc and Lead
Quotations from blueprint or model

JIGS-TOOLS-DIES

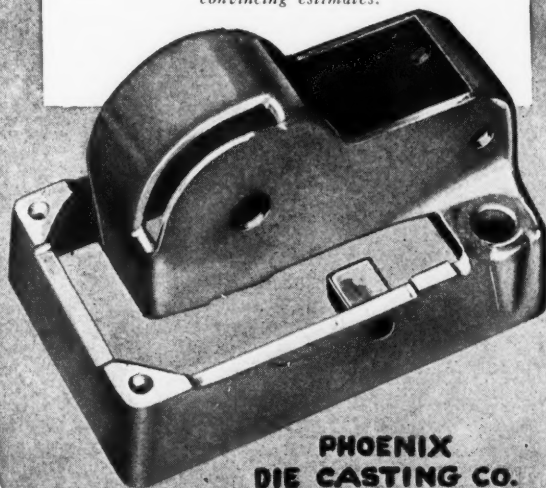
Our equipment includes Pratt & Whitney Jig Boring Machine, Lucas Boring Mills, Gary Planers, Die Filing Machines. Prompt Service. Try us.

AMERICAN TOOL & MANUFACTURING CO.
URBANA, OHIO
A CARD WILL BRING OUR CATALOG

PHOENIX DIE CASTINGS

If you're interested in cutting costs you'll be interested in Phoenix Die Castings. They are made by forcing molten metal into dies under pressure, and are so accurate and close to specifications that they require no finishing operations. Not only that, but they are smoother and harder than sand castings, have thinner walls and take a brilliant polish.

Send samples or blue prints for convincing estimates.



**PHOENIX
DIE CASTING CO.**
BUFFALO N.Y.

BAKELITE MOULDS

One of our specialties is Moulds for Bakelite, Celluloid and all Plastic Materials.

METAL STAMPINGS

Stamping, Coining, and Engraving Dies
Tools, Jigs, Fixtures and Machine Work

H. Loeffler & Co., Est. 1879 295 Washington St., NEWARK, N. J.

HIGH GRADE

DIES-JIGS-FIXTURES

Light and Heavy Stampings

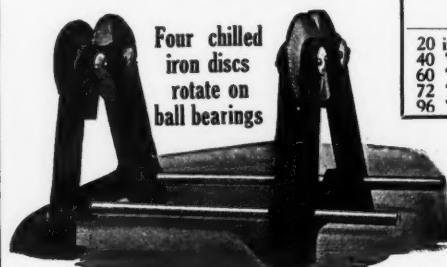
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SINKO TOOL & MFG. COMPANY

351-359 N. Crawford Avenue, Chicago, Ill.

Anderson Improved Balancing Ways

NO LEVELING REQUIRED



Four chilled
iron discs
rotate on
ball bearings

They are made in
the following sizes

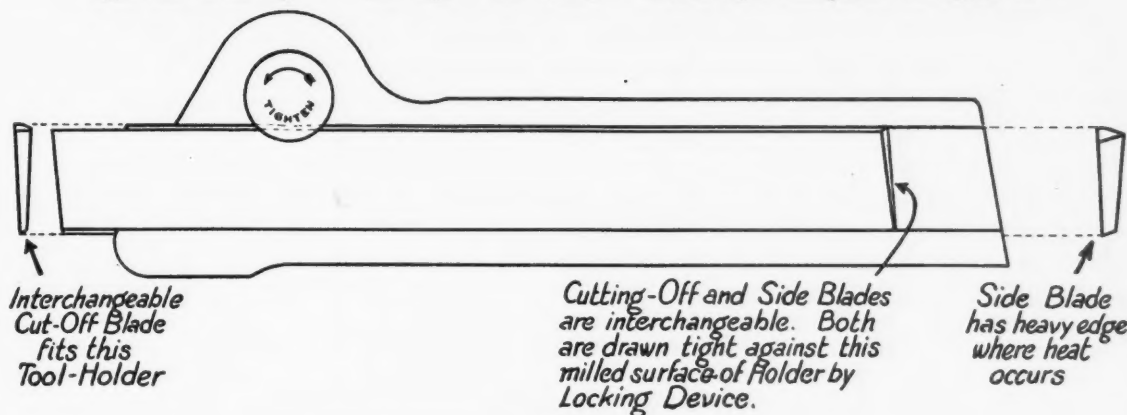
Swing	Greatest Distance Between Standards	Capacity in Lbs.
20 in.	20 in.	1,000
40 "	30 "	2,000
60 "	30 "	2,000
72 "	66 "	5,000
96 "	88 "	10,000

A simple and excellent device for balancing, straightening and truing.

Write for full information

Manufactured by
ANDERSON BROS. MFG. CO., 1910 KISHWAUKEE STREET
ROCKFORD ILLINOIS

Two Operations with ONE TOOL HOLDER



"AGRIPPA" Cutting-Off and Side-Tool Holder

Both Cutting-Off and Side blades are interchangeable in WILLIAMS' "Agrippa" Holders—another exclusive feature. You'll have no broken studs with the locking device either, and it is **positive**—the greater the pressure on the blade, the tighter the lock.

Note that there are no obstructions on the cutting side of this tool holder—you can work close to the chuck or face plate. "Agrippa" Holders have many features which save you time and speed up production. Write for literature now.

J. H. WILLIAMS & CO.

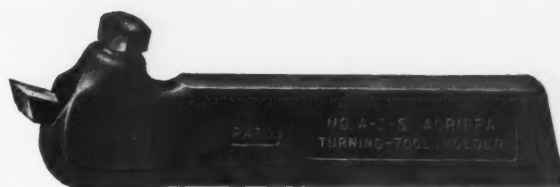
"The Drop-Forging People"

New York BUFFALO Chicago

WILLIAMS
SUPERIOR DROP-FORGED TOOLS
"AGRIPPA"
TOOL HOLDERS
"THE HOLDERS THAT HOLD"



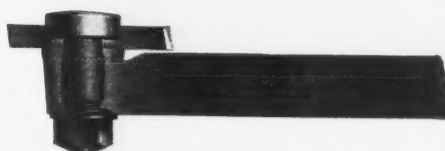
Cutting-Off and Side-Tool. Also furnished with right and left hand offset shanks.



Turning-Tool. Also furnished with right and left hand offset shanks.



Threading-Tool with Lockable-Spring head. Equally efficient as a turning-tool holder.



Planing-Tool. The serrated ring permits setting the bit at ANY angle. An ideal "goose-neck" tool when Holder is reversed.





There were no * * * * in the letter to Jimmy

Recently we sent some taps to a prominent nut and bolt company in Detroit. It happened that the test of some of these taps against others was run at night. Whereupon our Detroit office received the following communication:

"In testing out the special taps which you left with me, the results on one in particular is quite interesting. As witness, the following verbatim note our night operator left for Jimmy.

Jimmy:

*That tap that was in No. 6 run all those nuts out and I put it in No. 3 and d*****d if it isn't still going to beat b****. If they'd order some taps like that they wouldn't have to get them by the arm loads. I broke about a half dozen of those other taps before midnight in No. 3. They're not worth a d*** — won't stand up.'*

"I have this tap with a few of the nuts produced thereon on my desk which I will be glad to let you have to show your friends in Hartford."

Is it any wonder that the operator's enthusiasm sought emphatic language for expression?

This much is true: Any tap that would make a mechanic write such an unsolicited report would save money for the Company that employed him.

Try P & W Taps in your own plant. Test them against any you can buy. Compare output and cost against any figures that any other taps make. Buy P & W — or not — from your own findings.

PRATT & WHITNEY CO.
Hartford, Connecticut

Division NILES-BEMENT-POND COMPANY

BIRMINGHAM	PHILADELPHIA	ST. LOUIS	LOS ANGELES
SAN FRANCISCO	CLEVELAND	BOSTON	ROCHESTER
CHICAGO	PITTSBURGH	DETROIT	CINCINNATI
			NEW YORK



No Projections

The close grouping of tools on turret lathe tool posts calls for the elimination of all projections — set screws and exterior clamping devices. The surfaces of Lovejoy Lathe, Shaper and Planer Tools are perfectly smooth — the cutter is rigidly held by the Lovejoy Positive Lock. The heavier the cut the tighter the cutter is held — even the jar of intermittent cutting will not loosen it. Thrust is received in a manner to minimize breaking strain — cutters can be hardened to the limit. Easy adjustment provides exceptionally long life for cutters.

The economy and convenience of Lovejoy Lathe Tools aid materially in lowering turning costs.

Interesting descriptive booklet sent on request.

**THE LOVEJOY
TOOL CO., Inc.**

Springfield, Vt.
METAL CUTTING TOOLS

The Gammons Taper Pin Reamer Saves 65% of Reaming Costs

It reams in any metal at least three times as fast as fluted reamers and the average breakage is one-tenth that of the best fluted reamers made.

For use in a drill press, electric or air drill. May be run at any reasonable feed or speed without fear of breakage.

Why not save the two-thirds in costs? Only too glad to explain fully.

The Gammons-Holman Co.

Dept. M.

Manchester, Conn.

Out of This We Made This



BEFORE



AFTER

RECUOT WITHOUT ANNEALING or altering the original temper. Spirals, side mills, plain mills, end mills and metal saws made as good as new. Send a trial order and let us demonstrate.

We recut old files as good as new

CHICAGO TOOL RECLAIMING COMPANY
143 West Austin Avenue CHICAGO, ILL., U. S. A.

Every
purchase of Winter Brothers
TAPS and DIES
cuts down the working day
allowing more time to enjoy the
Beauties of Nature

WINTER BROTHERS COMPANY
WRENTHAM, MASS.

DETROIT CHICAGO CLEVELAND
BUFFALO PITTSBURGH

WINTER



Colton-Detroit High Speed Drills

Accurate Holes—

Low Drilling Costs

"Colton-Detroit" on the shanks means better drills that stand up under maximum speeds and feeds and can be depended upon to give the most production between point grinds.

The angle of the cutting lips and the thickness of web insure the minimum of torque and thrust and require less horsepower in operation.

Send for details of Colton-Detroit Standard and Special Drills, prices and deliveries.

ARTHUR COLTON CO.
2618 Jefferson Avenue, East
DETROIT, MICH.

REPRESENTATIVES: New York City: F. A. Brady, Inc., 30 Church St. Milwaukee: General Sales Agency, 3205 Vine St. Pittsburgh: Samson Tool & Machine Co., 6129 Jenkins Arcade Bldg. Philadelphia: Wenson Tool Co., 745 North Sixty-third St. San Francisco: L. G. Henes, 75 Fremont St. Los Angeles: L. G. Henes, 1418 Santa Fe Ave. Cincinnati: Advance Tool Co., Canal and Jackson Sts. Syracuse: Mr. Wm. G. Harvey, 403 Snow Bldg. Richmond, Va.: D. B. Parker, 1039 Mutual Bldg.



What's Wrong With This Picture?

This ragged excuse was once as fine a drill as was ever hot twisted from a piece of tough steel, but improper repointing ruined it. Too high a heel is the particular trouble here—a drill lacking clearance back of the cutting edge will drag and eventually break.

"How to Point Celfor Drills" is the title of a large photographic wall chart prepared by the Clark Equipment Company. It pictures in detail the correct methods of drill pointing. You can have one of these charts FREE—merely write for it.

CLARK EQUIPMENT COMPANY
1199 Days Ave., BUCHANAN, MICHIGAN



RED LINE

The World's Finest Expansion Reamer

In Automobile Service Stations

So well adapted to automobile repair work are Red Line Expansion Reamers that many leading motor-car manufacturers not only recommend but furnish them to their service men. Official tests by automobile engineers show 1000 to 2000 pistons reamed by Red Line reamers before first regrind. No wonder they have standardized!

In the Factory

Production Managers in many plants are specifying specially constructed Red Line Expansion Reamers made to their own specifications. This practice is real economy on the production job, and promotes a high standard of accuracy on all kinds of work. Countersunk expanding plug permits from 6 to 8 regrindings.

Send for our catalog

Modern Reamer Specialty Co.

Factory: Millersburg, Pa.

Sales Office: 2401 Chestnut St., Philadelphia, Pa.





Unretouched portrait of Threadwell Taps

Measure their performance by the cost per tapped hole

That which is costly for one shop may seem reasonable in another—it all depends on the kind of product you make and sell. But whatever your standard of cost measurement—cost per tapped hole is the recognized standard for comparing tap costs. It is on a comparison of cost per tapped hole that Threadwells win!

On this basis we ask you to try Threadwell Taps—measure their performance by the cost per tapped hole for *your* work.

In the constant need for thread-cutting tools capable of working under the high speeds maintained today, Threadwell Thread-Cutting Tools have kept pace with the revolutionary changes made in machinery for the production of duplicate threaded parts.

Let us know your problem and we shall be glad to supply taps or dies to meet it, standard if possible — special if necessary.

THE THREADWELL TOOL COMPANY GREENFIELD, MASS.

1323 Dime Bank Building.....Detroit, Michigan
1907 W. 45th Street.....Cleveland, Ohio
158 Chambers Street.....New York, N. Y.
2219 Maplewood Avenue.....Richmond, Virginia
18 South Clinton Street.....Chicago, Ill.

610 Michigan Street.....Milwaukee, Wis.
604 Mission Street.....San Francisco, Cal.
2204 Packard Building.....Philadelphia, Pa.
Pioneer Building.....Seattle, Washington

Agents for the British Empire, Coats Machine Tool Co., London, England



TAPS—DIES—SCREW PLATES AND SMALL TOOLS



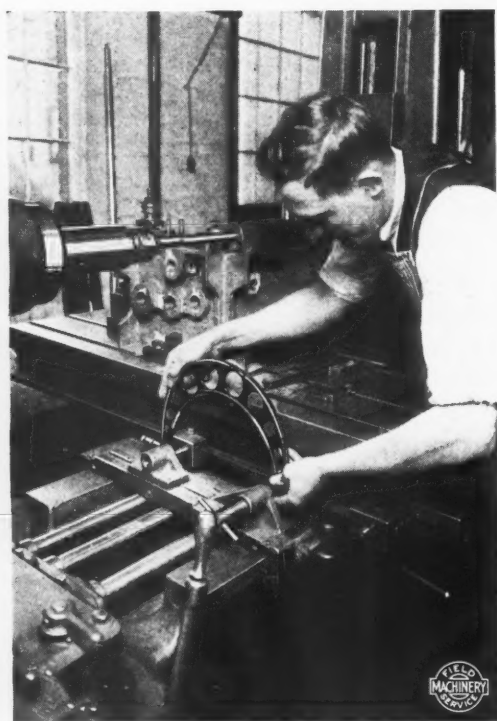
Better Threads— Lower Costs

The exclusive design and excellent workmanship in *Card Threading Tools* are the result of 50 years of painstaking specialization in producing correct tools for every class of tapping.

Recommended for tapping through holes in cold rolled steel, forgings, malleables, aluminum, bronze, brass, monel metal and copper. Try them.

New Catalog No. 31 on request.

S.W. CARD MFG. CO.
DIVISION OF UNION TWIST DRILL CO.
MANSFIELD, MASSACHUSETTS, U.S.A.



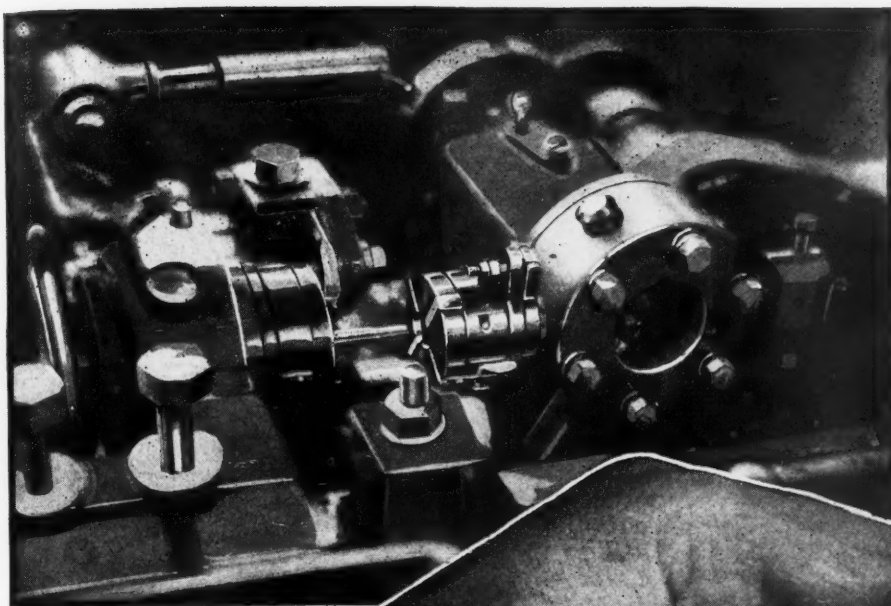
**J. T. SLOCOMB
COMPANY,**
Providence, R. I.

“—the Longest Lived Micrometer that can be bought”

Slocomb Tools always hold up their end of the work in the shop. Generations have used them and profited by their use. Products measured with Slocomb Micrometers deliver the maximum of profit. The losses due to inaccuracies and inevitable comebacks due to defective products are eliminated. The highly tempered tool steel spindle snugly fitted into a removable bushing has earned for the Slocomb the reputation—“The Longest Lived Micrometer that can be bought.”

Slocomb Micrometers and Slocomb Center Drills are made in sizes for every need. Let us send the complete catalog.





One every four seconds

A little over a year ago, the Conn-Perry Mfg. Co. put Geometric Threading Tools to work on a variety of threaded parts. Today there are 15 Geometric Tools in the shop.

The one we show is threading Carbureter Needle Bodies on a Brown & Sharpe Automatic Screw Machine. Thread diameter $\frac{1}{4}$ in. Threaded, 32 U.S. Length 1 in. Production, one every four seconds.

One set of Geometric Chasers average 150,000 of these parts.

High production, high economy, high quality and high profits are all found in Geometric Threading Tools.

Also manufacturers, for more than 30 years, of the well-known Geometric line of Collapsing Taps and Threading Machines. If it can be threaded, Geometric has the tool to do it.



Right in the Lead

The Geometric Tool Company

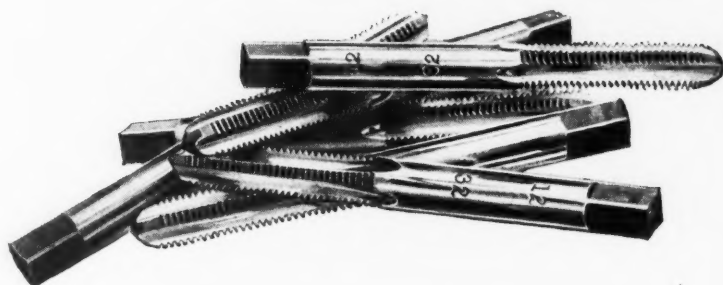
Westville Station

New Haven, Conn.

BRUBAKER

Quality Taps for Fast Accurate Tapping

Brubaker Machine Screw Taps may be had singly or in sets of taper, plug and bottoming, like hand taps. Correctly designed; true in pitch, lead and diameter they cut fast with minimum breakage and insure tapping accuracy.



W. L. Brubaker & Bros. Co.

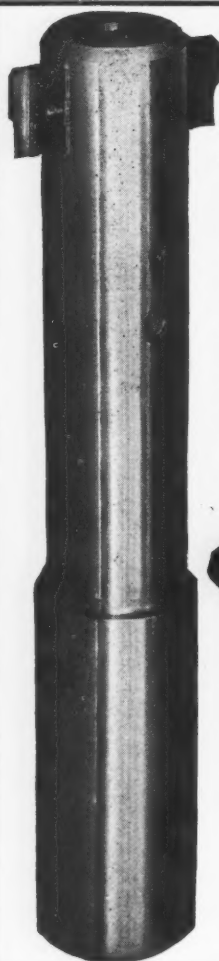
Factory: MILLERSBURG, PA.

Sales Office:

50 Church St.

New York, N. Y.

Catalogs 6 and 6-A show the full line of Brubaker Taps with prices. Let us send them.



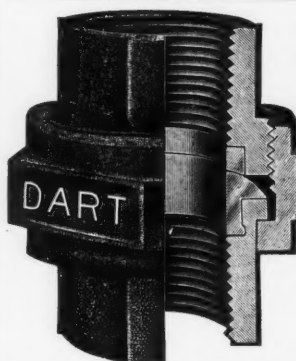
Madison Boring Bars Eliminate Overheating

The toughest Alloy Steels and Bronzes are easy for Madison Boring Bars. They have been known to increase hole-boring production on these metals by as much as 400% without overheating the tools or distorting the work.

They are adjustable to .00025 and incorporate a floating cutter that compensates for any misalignment in Automatic or Turret Lathes. Try them—or send for catalog if you'd like further details.



Madison Mfg. Co.
Muskegon, Michigan



Pipe Fittings that Fit!

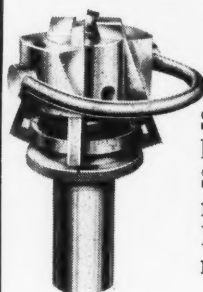
Dart Unions, Ells, Tees and Flanges have bronze to bronze seats that will not rust or corrode; clean-cut, accurate threads. They make pipe unions that are trouble proof and wholly satisfactory under all conditions. Send for samples and catalog.

E. M. Dart Mfg. Co., Providence, R. I.

The Fairbanks Co., Sales Agents
Canadian Factory: Dart Union Co., Ltd., Toronto

RI-SINGER

Adjustable Hollow Mills



Save tool expense — equal to highest precision requirement. Six sizes *only* needed to cover range from 0" to 2½" diameter. High speed steel cutters have micrometer adjustment.

Territory open

Send for new catalog

REISINGER MACHINE TOOL CORP.
839 LAKE AVE., ROCHESTER, N. Y.

MURCHEY



Continuous operation is the final test of tool quality. A six months non-stop run in a well-known automotive plant finds this Murchey Collapsible Tap standing up well without showing a single weakness production engineers can criticize.

Murchey Threading Equipment—fifty-nine sizes of Collapsible Taps, forty-two sizes Self-Opening Die Heads—are thoroughly modern tools, built to stand the strain of rapid production and long and constant service.

Automotive and other production engineers judge by results; they favor Murchey equipment because *they get them!*

*Prove it — try any
Murchey Threading
Tool for 30 days,
free!*



**MURCHEY MACHINE
& TOOL COMPANY**

34 PORTER STREET

DETROIT

MICHIGAN

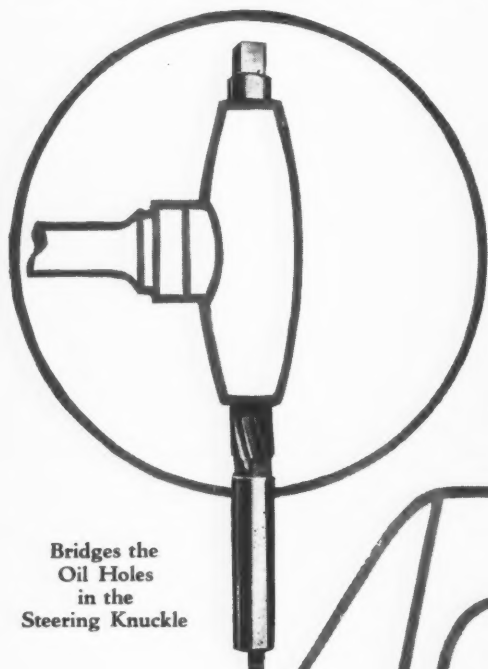


AGENTS: Cleveland Office, 5100 Superior Ave.; Pittsburgh, Barney Machinery Co., Union Trust Bldg.; Chicago, R. E. Ellis Engineering Co., 621 Washington Blvd.; Haviland Wright, 2204 Packard Bldg., Philadelphia, Pa.; Kemp Machinery Co., 215 North Calvert St., Baltimore, Md.; Machinists Tool Supply Co., 414 E. 3rd St., Los Angeles, Calif.; R. C. Neal Co., 76 Pearl St., Buffalo, N. Y.; 46 Andrews St., Rochester, N. Y.; 107 Gifford St., Syracuse, N. Y.; Coats Machine Tool Company, 14 Palmer Street, Westminster, London, S. W., England; Fenwick Freres & Company, 8 Rue de Roeroy, Paris.

A Smooth-Kut Reamer

(TRADE MARK REG. U. S. PAT. OFF.)

for Auto Axles
and
Steering Knuckles



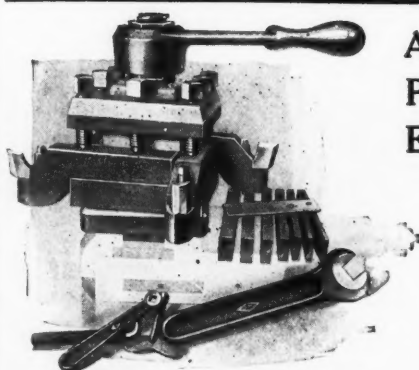
Smooth-Kut Full Spiral Expansion Reamers are made with extra long pilots for jobs like these. They cut an exceptionally smooth hole and ride easily over slots and oil grooves. They cannot chatter because the spiral flutes shear the metal. The regular Smooth-Kut expansion feature is of greatest advantage on this class of work. In use by some of the largest automobile manufacturers.

Originators and Manufacturers of the First
Spiral Expansion Reamers Ever Made

Millersburg Reamer & Tool Co., Inc.
MILLERSBURG, PA., U. S. A.

Patented
April 7, 1925

Write for further
information



A Handy Tool Post for Engine Lathes

"The O. K. Four Way Tool Post" is singularly handy, quick-acting and compact. It is made to fit any engine lathe 14" or larger, and special holders are furnished made with sufficient drop to

bring cutting edge on center of lathe regardless of tool holder size.

The whole square bottom of The O. K. Tool Post engages in a bottom plate at an angle of 45°—the bottom plate is tongued to fit "T" slot in lathe bed. This construction forms a positive indexing method which is almost instantaneous in action.

Catalog describes it completely—Let us send it.

"Our Service Department is at your Command"

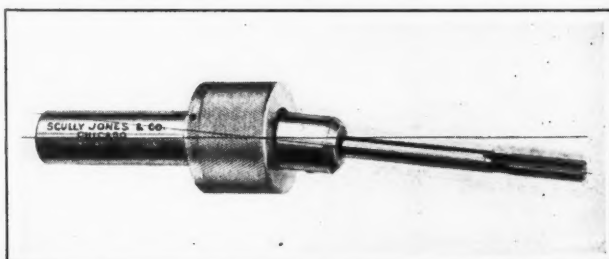
THE **O K** TOOL
CO., INC.
Shelton, Conn.

O.K.

Tools for
LATHES, SHAPERS,
PLANERS, BORING
MILLS, AUTOMATICS,
SPECIAL MACHINES,
MILLING MACHINES

Self-aligning Reamer Holder

For Screw Machines, Turret Lathes, Drill Presses



Has a full floating action which compensates for all irregularities in machine alignment. It finishes holes with Hand Reaming accuracy. Complete specifications in our Small Tool Catalog 35.

SCULLY-JONES & CO., Tool Division 13th and Robey Sts.
CHICAGO, ILL.
Representatives & Warehouses: DETROIT, MICH., Gross & Heming, 704 Det.
Sav. Bk. Bldg.; CLEVELAND, OHIO, Cleveland Tool & Supply Co., 1427-37
W. Sixth St.; NEW YORK CITY, L. C. Biglow & Co., Inc., 250 W. 54th Street.

The MICHAUD Safety Lathe Dogs

Rigid
Well-balanced
Made of
high-grade steel

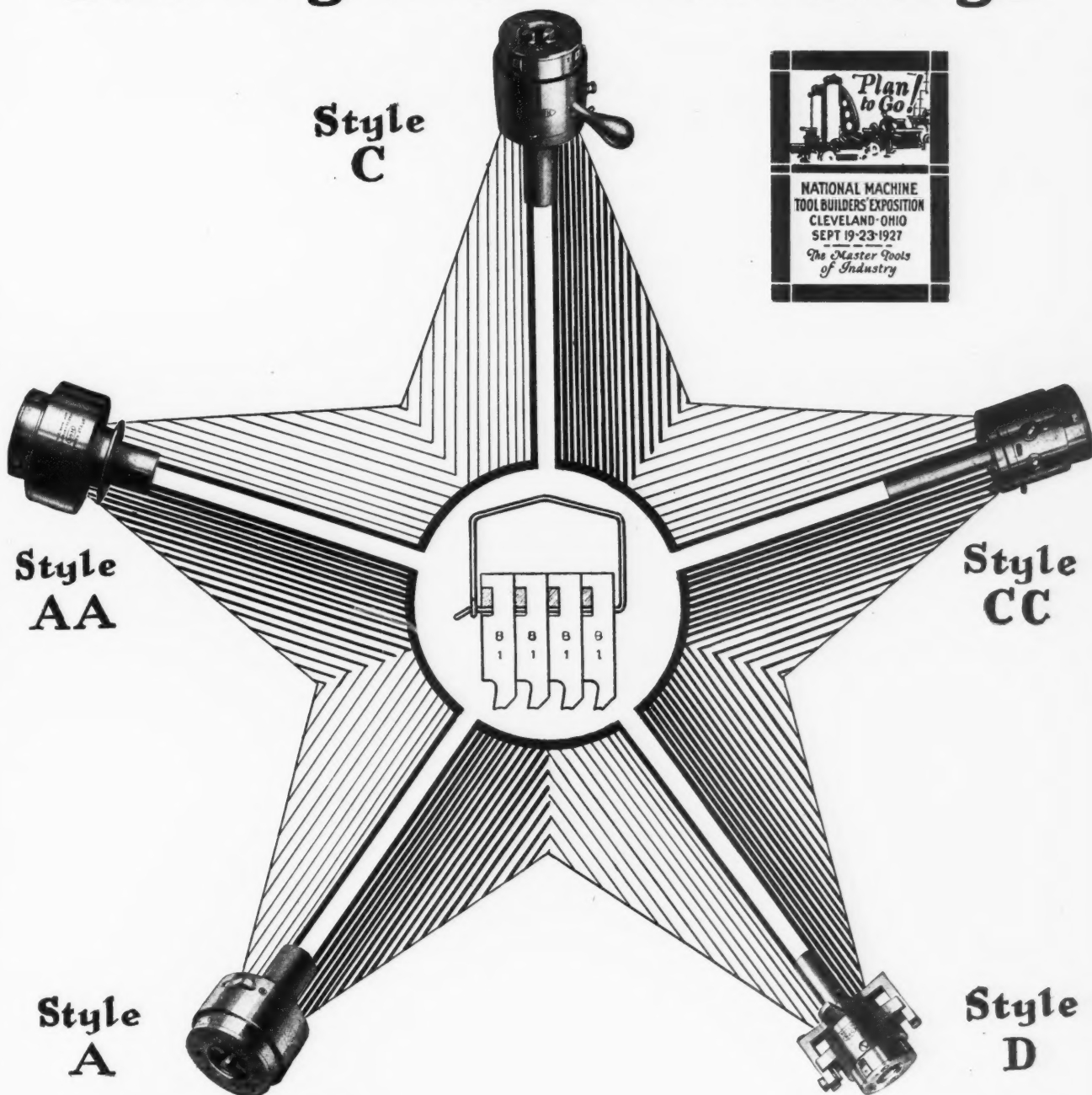


Hundreds of users can testify that the "MICHAUD" has no equal in its particular field. If you are looking for a safety lathe dog that is 100% safe, you can't afford to pass up this line.

Bridgeport Safety Lathe Dog
and Machine Co.

P. O. Box 293 Willimantic, Conn.

One Big H & G Advantage



ALL 5 STYLES

use this One set of Chasers

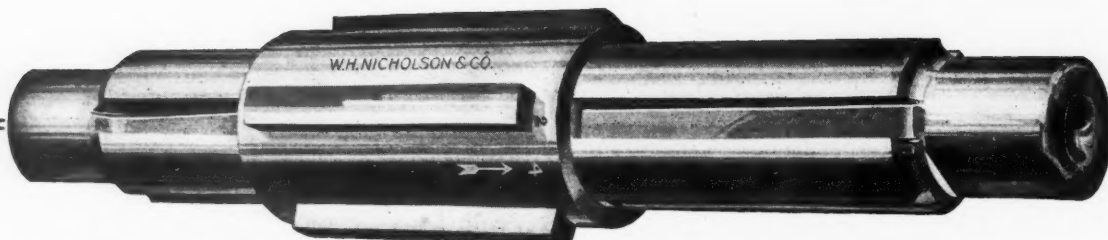
THE above illustration shows in the center a set of H & G Chasers for a 9/16" size H & G die head. The same set may be used in every style of 9/16" H & G Die Head made. This feature makes it possible to shift work and chasers from hand turret to single spindle or to multiple spindle without waiting for new chasers and provides a marvelous simplification of your chaser stock.

All H & G Die Heads have the same basic principles that have proven ideal after years of service. All chasers are solidly supported in the same manner, directly over the chamfer or cutting point and the same positive action that closes the chasers, opens them instantly and simultaneously.

There are sizes and styles of H & G Die Heads for all machines on which threads are cut. Send for this new Booklet.

18
VITAL QUESTIONS
to ask
when selecting
a Die Head

The Eastern Machine Screw Corporation, New Haven, Conn.



What mechanic who knows the convenience of using Nicholson Expanding Mandrels on lathe, miller or grinder, is willing to take time to make a solid mandrel for every job? Nicholson Expanding Mandrels come nine to a set and enable the mechanic to fit any hole from $\frac{1}{2}$ " to 7" *instantly* without wasting time or money.

Our booklet "The Expanding Mandrel, Its Practical Application"

W. H. NICHOLSON & CO., 112 Oregon Street, Wilkes-Barre, Pa.

FLEXTOOLS

Speed Up Nut Setting and Screw Driving

Flextools are Electrically Driven Hand Tools which increase to an amazing degree the amount of work your men can do. They save time, labor and money on screw driving, nut setting, grinding, polishing, drilling, etc.

A planetary reduction gear enables workmen to vary tool speed while motor runs at constant speed. The tool does not start until in contact with work.

When they see them in actual service, practical Shop Men say:
"FLEXTOOLS certainly are good"

Flextool "A" weighs two and one quarter pounds; has a 5 to 1 reduction, and is ideal for screw-driving and nut-setting at variable speeds.

Flextool "A2", weighing only fourteen ounces, is of the same design, built for lighter work.

Flextool "B" runs at motor speed and is adapted for operations involving drilling, grinding, etc.

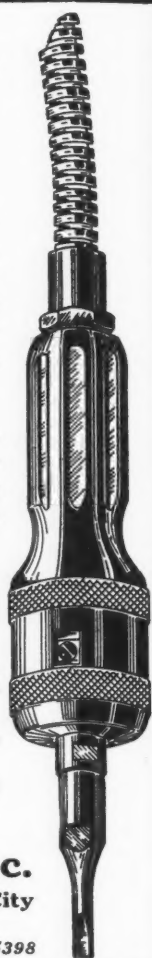
FLEX-TOOL CO., Inc.

149 Broadway

New York City

Note:
Territory Open.

Telephone
Hanover 5397-5398



SPECIAL

and Standard, Milling Cutters, Saws, Gear Cutters, Circular Slitting Knives, Special Tools and Solid Type Reamers.

COWLES TOOL COMPANY, Cleveland, Ohio
MILLING CUTTER SPECIALISTS

TAPS and DIES

REGISTERED

TRADE-MARK



The Famous "Carpenter Quality"

Precise Uniform Durable

J. M. Carpenter Tap and Die Company

Oldest Tap and Die Makers in America

Pawtucket Rhode Island

CHAMPION

Champion Tools stand up under the hardest service; do their work rapidly, effectively and easily. Cost no more than others which are merely ordinary. May we send our catalog?

TOOL HOLDERS, EMERY WHEEL DRESSERS, EXPANDING MANDRELS, LATHE DOGS, C CLAMPS, SHOP FURNITURE

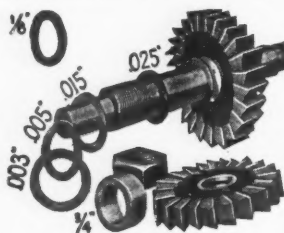
THE WESTERN TOOL & MFG. CO.

SPRINGFIELD, OHIO, U. S. A.

CHAMPION

Steel Spacing Washers

Send for free assortment in the sizes you use most. Stock sizes for arbors of the following diameters:



$\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1 , $1\frac{1}{4}$, $1\frac{1}{2}$, $1\frac{3}{4}$, 2 , $2\frac{1}{4}$, $2\frac{1}{2}$, $2\frac{3}{4}$, 3 , $3\frac{1}{4}$ and 4 inches and larger.

Stock Thicknesses: .001, .002, .003, .004, .005, .006, .007, .008, .010, .012, .015, .020, .025, .032, .047, .063, .093, and .125 inch.

Spacers thicker than $\frac{1}{4}$ " are turned from tubing but not carried in stock.

DETROIT STAMPING CO.

3445-3459 West Fort St.

DETROIT, MICH.



You Get 10 Times More Service

from Red-E High Speed Steel Lathe and Grinder Centers than from the ordinary carbon steel kind. Hence greater production and lower costs. Catalog 21 lists them.

Let us send it.

The Ready Tool Co., Iranistan Ave., Bridgeport, Conn.

Square and Hexagon Holes Drilled

The Watts method of drilling triangular, square, hexagonal and other holes is faster, cheaper and unusually more accurate than other methods of doing the work. A practical operation with simple, practical tools. Let us tell you about it.

Watts Bros. Tool Works

760-70 Airbrake Avenue, WILMERDING, PA.



TOOLS THAT GO AND GO

Send for the new Go & Go Catalog "C"



An up to the minute 224 page CATALOG showing the complete line of GO & GO PRODUCTION PROFILE and FORMED type MILLING CUTTERS and REAMERS, both STANDARD and SPECIAL. IT is full of VALUABLE MILLING INFORMATION. Just drop us a card.

GODDARD & GODDARD COMPANY

DETROIT

MILLING CUTTER ENGINEERS

**New Type
Equipment
for
Rotary Filing
Polishing
and Grinding**



**Originators
Developers
Manufacturers**

Type RF-M4

Type RF-M4



THIS illustration shows another "STRAND" Flexible Shaft Assembly which will be appreciated by die makers for Rotary Filing, Polishing and Grinding. In fact a useful and valuable machine for all kinds of metal finishing on small and various shapes.

EQUIPMENT

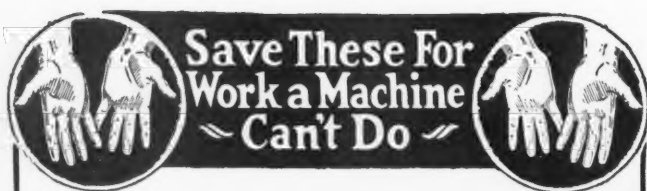
1/4 H.P. motor, switch and wiring; Strand "Three Speed" Motor Countershaft; 5 ft. Flexible Shaft; Ball Bearing Hand Piece, with Collet; 8 Assorted Shapes Rotary Files; 9 Assorted Grinding Wheels, Rubber Polishing Drum and Emery Cloth Bands; 3 Wheel Spindles; Wrenches; Motor Mounted on Adjustable Swivel Column, Bench Type.



We build many types and sizes of Flexible Shaft Equipments. Send for catalog.

N. A. STRAND & CO., Chicago

Main Office and Factory: 5001-5009 North Lincoln Street



Die Grinding with Haskins H-4 Equipment

Investigate, Demonstrate and Know

HASKINS Flexible Shaft Equipments are one of the easiest types of machine tools to become thoroughly acquainted with.

They are essential equipments in prominent use wherever there is metal grinding, die sinking, pattern making, rotary filing, scraping, drilling, wire brushing, sanding, cotton buffing and polishing operations to be performed.

INVESTIGATE—We have available for you a group of bulletins, each applying to a particular industry—one of which is yours. These show practical, everyday operations as well as the proper equipments and the specially developed tools needed to produce a better quality of product at a labor saving cost.

DEMONSTRATE—Manufacturers who want to **KNOW** exactly how HASKINS Flexible Shaft Equipments will perform—who want to see just how these specially designed tools will do when used with the recommended equipments, will be privileged to **DEMONSTRATE** them under their own plant conditions.

Tell us what you do or what you make and we will mail you proper information. Then when you make a demonstration you can **KNOW** how Haskins Equipment will improve products and cut costs.

R. G. HASKINS CO.

Portable Flexible Shaft Machinery

4634 Fulton St.

CHICAGO, ILLINOIS

BRANCH OFFICES:

Boston, 259 Franklin St.
New York, 151 Fifth Ave.
Pittsburgh, 5536 Penn Ave.
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Detroit, 1645 Howard St.
San Francisco, 116 Ninth St.
Seattle, 918 Western Ave.
Milwaukee, 145 West Water St.
St. Louis, 3217 Locust St.
Kansas City, 705 Delaware St.



Complete File Safety

File handles which cost little to buy and which soon break are no economy—and their use may injure and disable a good man. Osgood Indestructible File Handles outlast 20 of the ordinary kind and are safety insurance for the user. A steel tube receives the file tang, distributes strain, and prevents breakage and splintering. The Kant Slip Ring keeps the handle from coming off.

With an Osgood Handle and an Osgood Safety File grip on the tip your file is 100% safe, and at top peak of efficiency.



Catalog lists styles and sizes of both—and many other convenient and profitable Osgood Tools. Let us send it.

J. L. Osgood Tool Company

43-45 Pearl Street, BUFFALO, N. Y.



Metal Finishing

All Types of Assemblies
All Types of Attachments

For Drilling, Buffing, Polishing, Grinding, Wire Scratch Brush work, and similar operations.

Motor—110 V.—60 Cyc.—1 ph.— $\frac{1}{4}$ HP. 1800.....	\$50.00
Motor—110 V.—60 Cyc.—1 ph.— $\frac{1}{4}$ HP. 3400.....	65.00
Motor—110 or 220 V.—DC.— $\frac{1}{4}$ HP. 3400.....	65.00
Chuck— $\frac{1}{4}$	6.50
Buff—6".....	1.00
Wire Scratch Brush—4".....	2.00
Grinding Wheel—6".....	2.25

This rugged tool, operating from a light socket, will render great efficiency in repairs and maintenance, for Automobile Paint Shops, Garages and Repair Stations, Body Plants, Hotels, Banks, Churches and Office Buildings, for quick repairs, drilling, buffing, grinding, removing rust, paint, etc. Also for polishing elevators and signs, store fronts and metal fixtures. In welding shops, for the removing of high spots and finishing dry surfaces of all kinds. Larger size tools upon request.

STOW MANUFACTURING CO., Inc., Binghamton, N.Y.
London Stock: 26 Charles Street

Flexible Steel Tubing

For carrying coolant on machines.
All steel construction. Durable.

Sizes: $\frac{1}{8}$ -, $\frac{1}{4}$ -, $\frac{3}{8}$ - and $\frac{1}{2}$ -inch inside diameter.

WHELOCK MFG. CO., Wheelock, Vt.

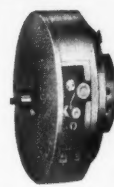


Facing on the Drill Press

use the M-D Facing Head; it faces like a lathe, has a single point tool which travels radially from center outward or reverse; feeds automatically and faces diameters from 6" to 24".

Details and prices?

MUMMERT-DIXON COMPANY
HANOVER, PA.





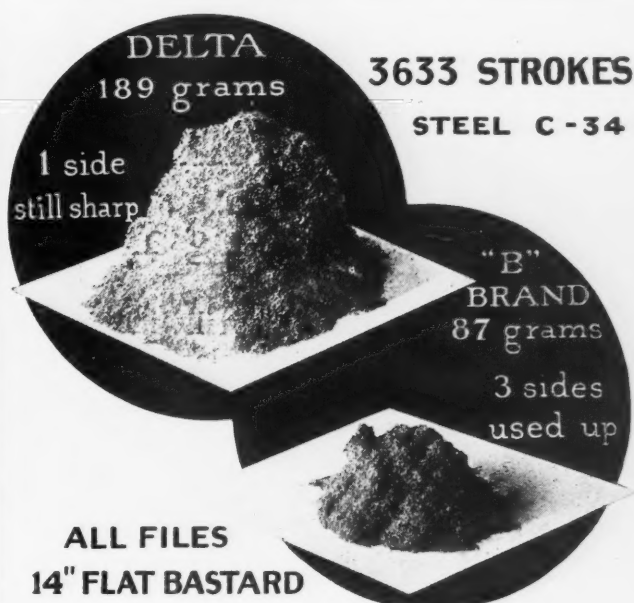
AMERICAN SWISS FILES

2400 shapes, sizes, cuts — each file guaranteed to meet the most exacting standards on the work for which it was designed.

An illustrated catalog simplifies selection; distributors in all large cities make ordering easy. Send for the "American Swiss" catalog, a sample file and a list of dealers in your vicinity.

American Swiss File & Tool Company

410-416 Trumbull Street, Elizabeth, N. J.



Which file is on your payroll?

The time user or the time waster— which? On the answer depends far more than your monthly file bill.

The two piles of filings shown above were made during a test by a large machinery builder. Both files were run in a testing machine, on tool steel of Rockwell hardness C-34. Speed was 55 strokes per minute; stroke, 6 inches; pressure, 25 lbs., relieved on back stroke.

The Delta file was taken at random from stock. The two "B" files were specially furnished for this test.

After 3633 strokes, *one* side of the Delta had removed 189 grams, and was still sharp. *Both* sides of one "B" file, and *one* side of the second, were worn out. They had removed only 87 grams.

The full test is described (omitting names) in a folder, "The Scale-Pans Tell!" You will want to read it.

"Buy Fileage as you buy Mileage"

DELTA FILE WORKS

BRIDESBURG



PHILADELPHIA

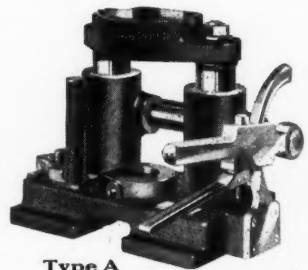
CLEVELAND UNIVERSAL DRILL JIGS

Simplify Drilling and Reduce Costs

Cleveland Universal Drill Jigs are so designed that by changing only the top plate or adaptor the jig is ready for a new job. The very large item of jig expense is thus materially reduced.

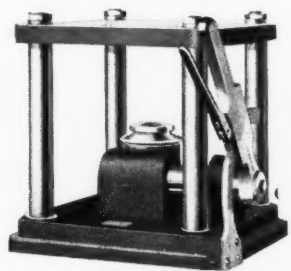
In addition, because of their simplicity and ease of operation, they increase production from 50-500 per cent. Loading and unloading time is about four seconds on most parts; one man can run two or more machines. No time is lost—no machines are idle. Chips do not lodge on locating surfaces. Set-up time is practically eliminated.

CLEVELAND UNIVERSAL JIG CO.
CLEVELAND, OHIO



Type A

There is a place for Cleveland Jigs in your shop. Two types cover all requirements — sizes ample for practically any job. Complete details on request.



Type B

Cut the cost of nut turning by
avoiding lost motion

The **FAVORITE REVERSIBLE RATCHET WRENCH**

works with a perfect mechanical movement that speeds up the nut turning, and saves money.

If you are still using the old-fashioned wrench send for booklet "Reduce the Cost of Nut Turning."

Greene, Tweed & Co.

Tool Department
Sole Manufacturers
109 Duane St. New York



When you buy Wrenches—
don't experiment

Specify COES

Three models. Sizes from 6 inches to 6 feet.
At good dealers everywhere.

COES WRENCH COMPANY

Established 1841

WORCESTER,

MASS., U. S. A.

AGENTS

J. C. McCarthy & Co., 29 Murray Street, New York City
J. H. Graham & Co., 113 Chambers Street, New York City

"Red Shield" High Speed Drills



ALL SIZES

THE STANDARD TOOL CO.

NEW YORK

CLEVELAND

CHICAGO

Hjorth Perfection Spring Winder

No factory complete without one. Makes every kind of springs. Right or left-hand.
Capacity to 3/32 wire \$1.25
Capacity to 3/16 wire 2.50
Capacity to 5/16 wire 5.00

If interested,
send for circular.

**Hjorth
Lathe & Tool
Company**

24 School St. Mass.
Boston,

Works: Woburn, Mass.



(Patented) Hardware Agents Wanted

Eclipse

INTERCHANGEABLE TOOLS—

Exclusively, were used in counterboring and spot-facing the old "LIBERTY" airplane and tank engines, eleven years ago.

And today, the improved ECLIPSE is—
but read the telegram—

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CLARENCE H. MACKAY, PRESIDENT

TELEGRAM

TELEGRAMS TO ALL AMERICA

CABLEGRAMS TO ALL THE WORLD

RECEIVER'S NUMBER

CHECK

TIME FILED

STANDARD TIME

Form 1

CLASS OF SERVICE DESIRED

FAST TELEGRAM	
DAY LETTER	
NIGHT TELEGRAM	
NIGHT LETTER	

The sender must mark on it opposite the class of service desired; otherwise the telegram will be transmitted as a fast telegram.

Send the following Telegram, subject to the terms on back hereof, which are hereby agreed to.

8 DE AX 10A 78 5 EXTRA PAID NL

PATERSON NJ JUNE 15 1927

ECLIPSE INTERCHANGEABLE COUNTERBORE CO

DETROIT MICH

ATTENTION MR R G MICHELL

ECLIPSE INTERCHANGEABLE COUNTERBORES ARE USED EXTENSIVELY IN OUR MACHINE SHOP IN THE MANUFACTURE OF PARTS FOR WRIGHT WHIRLWIND ENGINES INCLUDING ENGINES USED BY COL LINDBERGH CLARENCE CHAMBERLAIN AND COMMANDER BYRD STOP TOOL EQUIPMENT OF FIRST CLASS QUALITY IS AN ESSENTIAL FACTOR IN PRODUCING RELIABLE ENGINES AND WE GRATEFULLY ACKNOWLEDGE THE PART PLAYED BY THE MANUFACTURERS OF MACHINES AND TOOLS IN HELPING US MAKE THE WRIGHT WHIRLWIND THE WORLD'S SAFETY AVIATION ENGINE

WRIGHT AERONAUTICAL CORPN

—It is indeed gratifying to
receive such commendation when one
has put forth conscientious thought and effort toward furnish-
ing the very best. Thank you—Wright Aeronautical Corporation.

Send for our new catalog No. 22

ECLIPSE INTERCHANGEABLE COUNTERBORE COMPANY

Sales Representatives

Atlanta
Baltimore
Buffalo

Chicago
Cincinnati
Cleveland

DETROIT.
Toronto Vancouver

Sales Representatives

Los Angeles
Muncie
New York

Pittsburgh
San Francisco
Syracuse

ITS USE

A good one for your driller, miller, shaper or planer.

The attachments mean that you can do much duplicate drilling without the cost of a jig.

Any vise will pay. More time is consumed in catching work than drilling it.

DRILL VISE

LIST (Subject to Discount)

No. 3, Jaws 6" long, Fig. 1, \$45.00, Fig. 2, \$40.00
No. 4, Jaws 9" long, " \$60.00, " \$54.00
No. 5, Jaws 12" long, " \$85.00, " \$75.00
V-Jaws extra, No. 3, \$5.00; No. 4, \$7.50; No. 5, \$10.00 each. One V-Jaw is usually sufficient per vise.

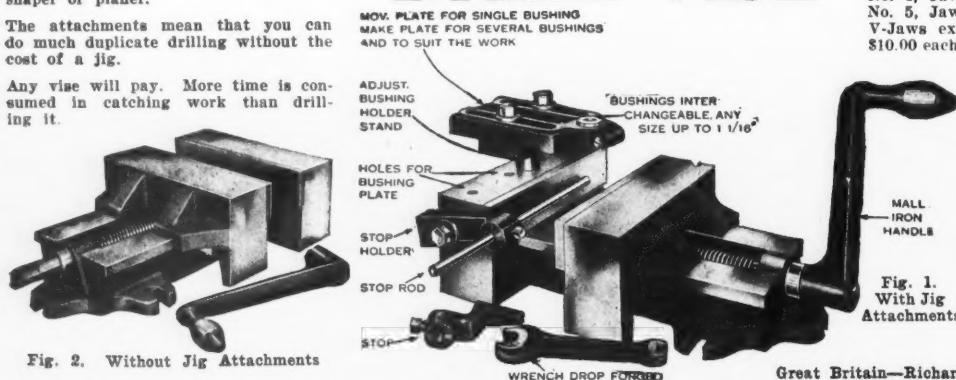
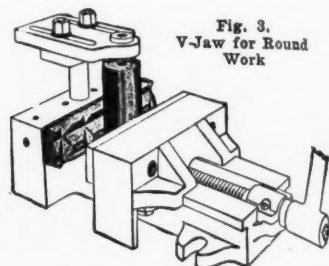
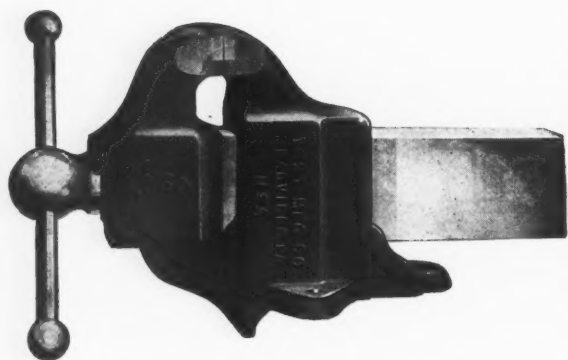


Fig. 2. Without Jig Attachments



THE GRAHAM MFG. CO., PROVIDENCE, R. I.

Great Britain—Richard Lloyd & Co., Ltd., Birmingham
France, Italy, Switzerland, Spain and Holland—Fenwick Freres & Co.
Germany—A. Kayser, Oranienstrasse, 126, Berlin



YOST—An Assurance

The name is a tacit guarantee of vise quality that will withstand the rough usage of machine shop work.

Yost Vises are strong, with powerful grips that do not need constant tightening; they are well built, long-wearing, work-holding equipment.

The line includes Stationary, Adjustable Jaw, Swivel Base, Universal Double Swivel Vises, Drill Press Vises, Pipe Vises, etc.

Send for a complete catalog.

YOST MANUFACTURING CO.
MEADVILLE, PA.

The DANGER of not having enough

VICES

"Not enough" means that workers will often have to leave their working stations and go to some distant point to use a vise. Often they have to WAIT for a vise to be vacated, or make a second trip. Possibly they stop and talk to other workers on the way "out" and on the way "back"—two idle instead of one. Put a

REED VISE

right at the work station of every worker who has even but occasional use for one and you will save money.

Reed Manufacturing Co., Erie, Pa.



Send for BOOKLET explaining the superiority of "Reed" Guaranteed throughout.

The Pronto Quick Operating and Wide Opening Lever Vises

Designed for Milling and Drilling Machines and are especially adapted for any work where a large number of pieces are to be quickly handled. MADE IN THREE SIZES.



Prices subject to discount of 45%.

MANUFACTURED BY

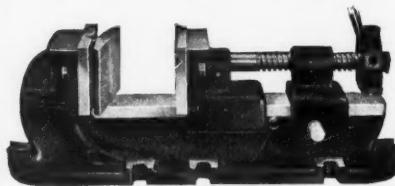
EDW. PURVIS & SON

110 YORK ST. successors to CARTER & HAKES BROOKLYN, N. Y.

No. 1 6 3/4" long-8 lbs. \$50.00
No. 1 1/2 8 3/4" long-17 lbs. \$60.00
No. 2 9 3/4" long-33 lbs. \$70.00

Standardize on This Vise!

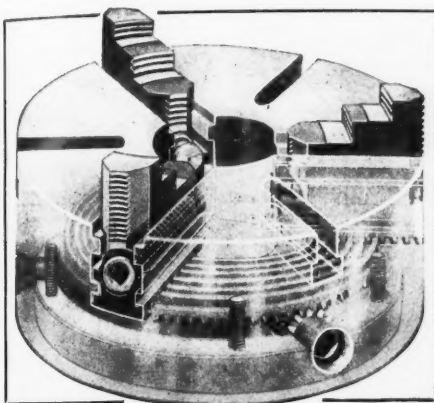
Follow the leads of representative organizations everywhere—it pays. Once you have experienced the handiness of a Gem Gear Drill Press Vise you will specify the make always. The big feature is the swivel jaw, which instantly adapts itself to work of any shape and holds like a bulldog, yet never damages.



Reduces setting-up time—increases production.

Three sizes, jaws opening to 10 1/2". May we send circular and price list?

J. E. MARTIN TOOL & DIE WORKS
548 West State Street, SPRINGFIELD, OHIO



With the *Right Chuck* Always Ready!

Quick, convenient chucking saves time setting-up—keeps production costs down.

The Union No. 83 Combination Chuck provides *the right* chuck for efficiently holding a wide range of work. Used as an Independent Jaw Chuck it is strong and rigid, more convenient than a Universal Chuck; as a Geared Scroll Chuck it is equally efficient. The Union Line provides chucking equipment for every class of work. Is our catalog in your files?

UNION MANUFACTURING CO.,

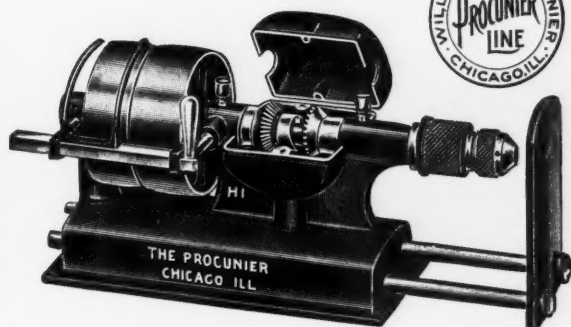
NEW BRITAIN
CONN., U. S. A.

Makers of a Complete Line of Chucks

BRANCH OFFICES WHERE STOCK IS CARRIED:

New York, 26 Cortlandt St.
Chicago, 25 So. Jefferson St.

Cincinnati, 308 Sycamore St.
San Francisco, 770 Folsom St.



"Procunier" Equipment Assures Economical Tapping

The "PROCUNIER" style L Bench Tapping Machine is equipped with the Procunier patented hand adjusted safety friction device for preventing tap breakage. It also has the well known "Procunier" driving and reversing clutch mechanism. The "DOUBLE-JAW" chuck holds securely all taps within its capacity, gripping and driving by the square and holding the tap true by the round of its shank.

Catalog M gives details of the "Procunier" line, shows how to reduce tapping costs with "Procunier" equipment.

Dealers in all principal cities of the United States,
Canada and Europe.

WILLIAM L. PROCUNIER
18 South Clinton St. CHICAGO, ILL.

MULTIPLE TAPPERS



cut cost; exact duplication of work; 2560 $\frac{3}{8}$ "-holes drilled and tapped in 8 hours.

40 malleable iron differential gear cases per hour.

**Compact
Simple
Durable**

Taps up to $\frac{5}{8}$ " with only $2\frac{1}{4}$ " between centers — larger sizes proportionately compact.

Put in Errington Tappers and save expense. Send blueprints and full particulars for outfit on trial to do your work.

ERRINGTON

Main Office and Works: Staten Island, N. Y.

New York Office—11 John St.

Boston Office—830 Old South Building

Chicago Office—549 W. Washington Blvd.

Catalog Francais: Edgar Bloxham, Paris, 12 Rue Du Delta

SWEETLAND CHUCKS

For versatility the Sweetland Chuck can't be equalled! Its jaws are reversible, and work independently or universally. Work of odd shape and intricate design is held in a bulldog grip, and, used as a universal, the chuck speeds up production work. Screws are braced against strain—the joint is dovetailed. "If a Sweetland won't hold, it can't be chucked." Sizes 6" to 32" in 3" steps, to 42" in 6" steps.

The Hoggson & Pettis Mfg. Co.
NEW HAVEN, CONNECTICUT



Ask for
Catalog
13-C

REDUCE YOUR SPECIAL EQUIPMENT

The Boston Universal Angle Plate lessens setting-up time, reduces costs for jigs and fixtures on a wide range of work.

Adjustable through 360° horizontally and 120° vertically—the work may be set to any desired angle and milled, drilled, ground, planed, etc., without resetting.

Vernier attachment reading to 5 minutes makes ample provision for accuracy on extra fine work.

Send for details of this money saving attachment

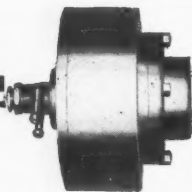
Boston Scale & Machine Company
100 Ruggles St., Boston, Mass.

Agents for Great Britain, Belgium, Italy, India, Burma and Ceylon, Japan, Formosa and Korea, Alfred Herbert, Ltd., Coventry, England.



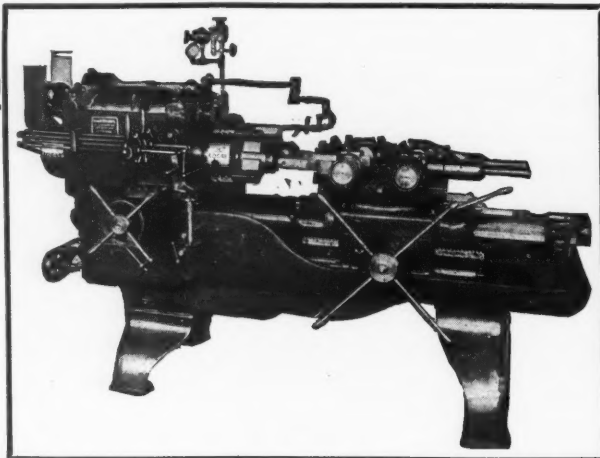
"LOGAN" Air Operated Chucks

Maximum Production with Minimum Loss of Time, Effort and Motion

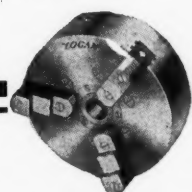


Model "R" Air Cylinder

For operating chucks or other devices mounted on revolving spindles. Sizes, 3 in., 4 1/2 in., 6 in., 8 in., 10 in., 12 in. and 14 in. diameter bore.

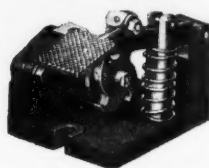


Jones & Lamson (Hartness) Double Spindle Turret Lathe and "LOGAN" Complete Air Operated Chucking Equipment.



Three Jaw Chucks

Combination and Universal types one-piece steel body. Sizes 4 in. to 24 in. diameter



"LOGAN" Foot Control Valves

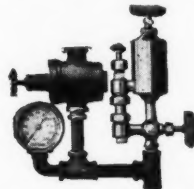
Save time in chucking. Hands are free to handle work. Size capacity 1/2 in. to 1 in.



EQUIP PRODUCTION MACHINES FOR PRODUCTION

There is a "LOGAN" Air Operated Device adaptable to all types of production machines to meet every work holding requirement fully described in Catalog sent on request.

Send for Catalog R-22.

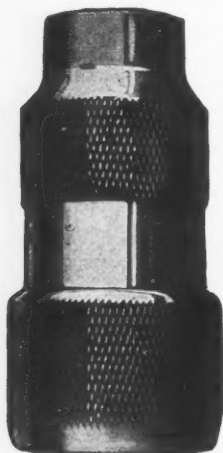


"LOGAN" Reducing Valve and Automatic Lubricator.

Any jaw pressure desired, lubricates Cylinder Packing.

THE LOGANSPORT MACHINE CO.

529 MARKET ST., LOGANSPORT, IND.



The BOKER CHUCK

Requires No Tools—
Cannot Slip

Keyless, a turn of the hand sets and releases the Boker chuck grip—a time saving feature. There is no slipping, eliminating the scoring of drill shanks. Ball bearing action—perfect balance—concentric—and they are simply constructed of only three units.

Your Hands are the only Tools required to Set and Release a Boker Keyless Chuck.

Let us send you a Boker Chuck on 30 days' trial.

H. BOKER & CO., Inc.

103 Duane St., New York City, N. Y.

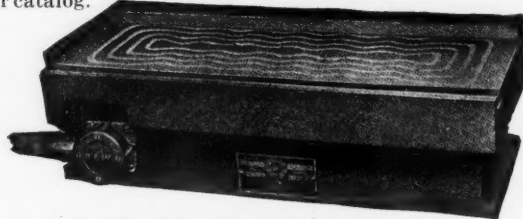
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D & W Chucks Spur Production

Whether your requirements call for flat or rotary type chucks, you will find D & W's superior to anything you have yet used. Oil-proof, water-proof and equipped with special demagnetizing switches, they secure maximum holding surface and are dependable always. Send for catalog.



J. & H. ELECTRIC CO.

161 Clifford Street

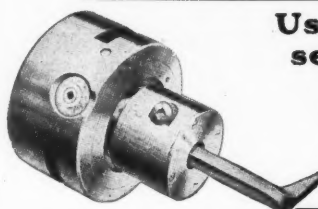
PROVIDENCE, R. I.

LAVOIE AIR CHUCKS

See them in operation! Note speed and simplicity and you'll want them for your chucking. May we send the booklet?

The Frontier Chuck and Tool Co., Inc.

30 Letchworth Street, BUFFALO, N. Y., U. S. A.



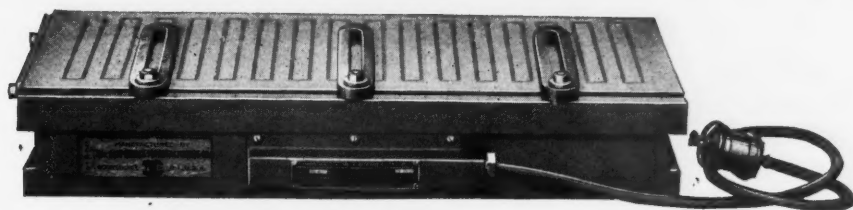
Use the Casler Off-set Boring Head

To reduce the cost of jigs and fixtures and the Casler Twin Screw Drill Chuck to reduce manufacturing costs.

Send your inquiries to

HERMAN CASLER
Canastota, N. Y.

SUPERPOWER



MAGNETIC CHUCKS

NEW DESIGN—lower—more compact—
NEW CONSTRUCTION—from top to bottom—
NEW POWER—greater and more concentrated
NEW SET-UPS—that astonish users
WATERPROOF! TESTED AND APPROVED

Send for Particulars and Specifications.

THE TAFT-PEIRCE MFG. COMPANY

WOONSOCKET

Manufacturers of Small Tools, Gages,
Milling Machines, and makers of tools



RHODE ISLAND, U.S.A.

Reamers, Magnetic Chucks, and Thread
and special machinery on contract.



WANTED: A Mark!

We have been asked why we don't put some kind of mark on our screws so that users may know beforehand whether they dare pull on them or not.

To identify Mac-it Socket Head Cap Screws and Mac-it Hollow Safety Set Screws look for the ROSETTE in the bottom of the hexagon holes. Then pull.

Set them up as tight as you want them. Adjust the screws as often as you need to. They stand the strain.

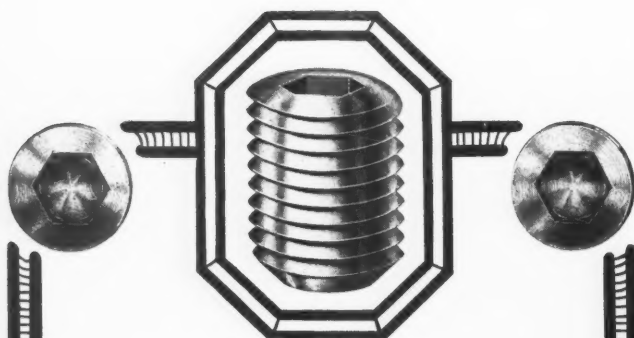
THE STRONG, CARLISLE & HAMMOND CO.

GENERAL DISTRIBUTORS

Set Screws

1392-1394 West Third St.,
Cleveland, Ohio

Cap Screws



Assembling

Comes to assembling: What a small cost for set screws, compared to the cost of machinist's time setting up the screws!

If he has to pet them into place, that brand's an expensive pet. If he has to dig out a broken screw it's an indirect dig at the payroll.

All good hollow screws save time. Save accidents and interruptions. In *machinist's* time an extra saving on cold-drawn "ALLENS."

30% *Extra Strength* for quick, tight set-ups; no let-ups in the assembling work or assembled job.

Fast Service from Local Stocks

The Allen Mfg. Co.

125 Sheldon St., Hartford, Conn.

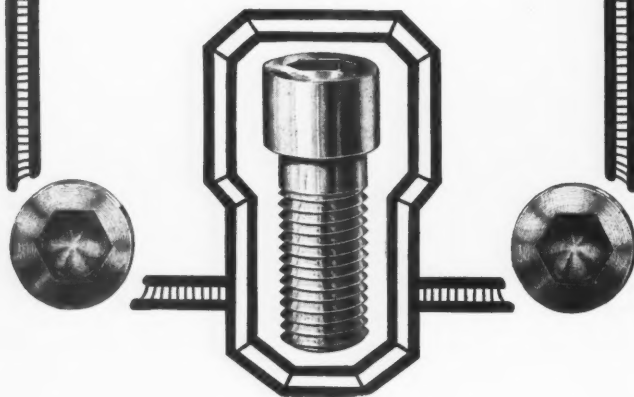
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E. P. Crawford
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Testing—

Automobile parts—shafts, pins, springs and other parts that must stand the strain of constant severe service can be *guaranteed* if tested before machining and after heat-treating with the

Shore's Portable Scleroscope

Simple, accurate, economical—makes 1000 tests per hour without damaging the finest surface.

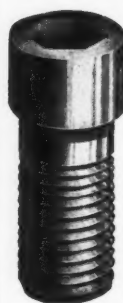
Bulletin 22 gives details of Shore's Scleroscope and the testing method.

The Shore Instrument & Mfg. Company

Van Wyck Ave., and Carll St., JAMAICA, N. Y.

FOREIGN AGENTS:

Agent for British Empire, Coats Machine Tool Company, Ltd., 14 Palmer St., Westminster, London, S. W. Yamatake & Co., Tokyo, Japan. Aux Forges de Vulcain, Paris, France. R. S. Stokvis & Zonen, Ltd., Belgium and Holland.



UNBRAKO

Hollow Set and Sockethead Cap SCREWS

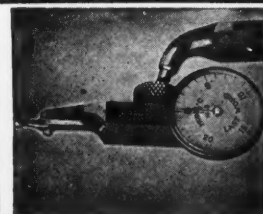
Won't fracture. Won't round in the hex. Won't mushroom at the point. Offer extreme strength, unvarying uniformity and low price. Write for sample screws for test. It costs nothing but will save you dollars.



Standard Pressed Steel Co.

Box 22

Jenkintown, Pa.



"LAST WORD"

UNIVERSAL Test Indicators

Send for Folder

H. A. LOWE

1874 E. 86th St., Cleveland, O.

APEX MACHINE CO.

DAYTON, OHIO

**Quick Change Drill Chucks
Friction Drive Tap Holders**

**Self-Opening Die Heads
Universal Joints**

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In Queensland—too Starrett Tools mean more to a man!

Read the letter reproduced below. It contains a more powerful and sincere argument in favor of a full kit of Starrett Tools than anything we can say.

The catalog which Mr. Hannah requests is the Starrett Catalog No. 23"D". It contains illustrations, descriptions and prices of more than 2500 fine tools. We will gladly mail you a copy on request.

THE L. S. STARRETT CO.
World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled
Steel Tapes—Standard for Accuracy
ATHOL, MASS., U. S. A.

Pearamon
North Queensland
Australia
21/12/26

The L. S. Starrett Co.
Could you send me a catalogue of
small machinists tools?

I work in a local shop with a pal
who has a complete range of tools bearing
your name. It is disappointing when the
boss sends him out on special jobs remarking
that he can make a better job with the tools
of his than I can, when I feel confident of
doing the work myself.

I saw one of your ads and took the
liberty of writing you.
I remain,

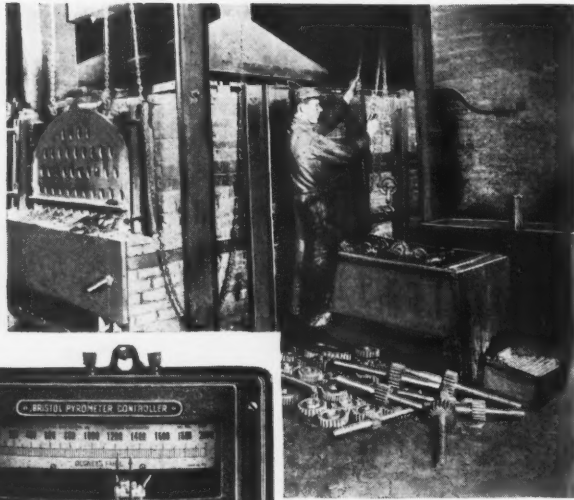
Yours truly,

Des Han nah

976

Use Starrett Tools

BRISTOL'S EQUIPMENT



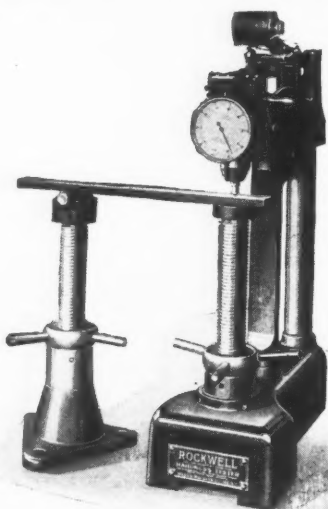
Heat Treating Temperature Controlled Automatically with Amazing Precision

With Bristol's Equipment it is possible to control automatically the regulation of heat treating temperatures, holding them within a very few degrees plus or minus—seven days a week. Bristol instruments are rugged as well as extremely sensitive—compensated for disturbing influences and unaffected by normal wear and tear. They require practically no attention.

Included are motor driven valves for gas, oil and air; automatic pyrometer controllers; recording devices; fire ends; protection wells; leads; and a variety of special fixtures.

Let us discuss your heat treating problems with you and offer suggestions for bettering control.

The Bristol Company Waterbury, Connecticut
FOR 38 YEARS
Bristol's RECORDING INSTRUMENTS



Hardness Testing in the Stock Room

We find that a great many who started to use the Rockwell Hardness Tester in the shop or heat treating department have bought another for the stock room.

Wherever long rods are to be tested the auxiliary jack shown is useful.

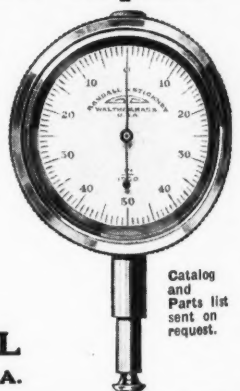
WILSON-MAEULEN COMPANY INC
382 Concord Avenue, New York

Long Service—Few Repairs

Perfection Dial Indicators are exceptionally well made. The finest of materials are used, all wear parts carefully hardened and tempered, painstaking thoroughness is used in finishing. The result is a highly accurate dial indicator, sensitive yet rugged, which will stand up under the hard service production gaging entails.

Fifty divisions each way of the dial, each equivalent to 0.001". Can be furnished with 100 divisions, or divided in metric units if desired at no additional cost.

FRANK E. RANDALL
248 Ash St., Waltham, Mass., U.S.A.



Catalog and Parts list sent on request.

Compact—Sensitive—Accurate—Durable The "ATLAS JUNIOR" INDICATOR

Reads over a range of 0.055"—at a glance. Dial may be set at zero after adjusting to work. Contact point can be locked in position for inspecting. Keep it in your pocket and use it anywhere. Details?

PRICE \$7.50

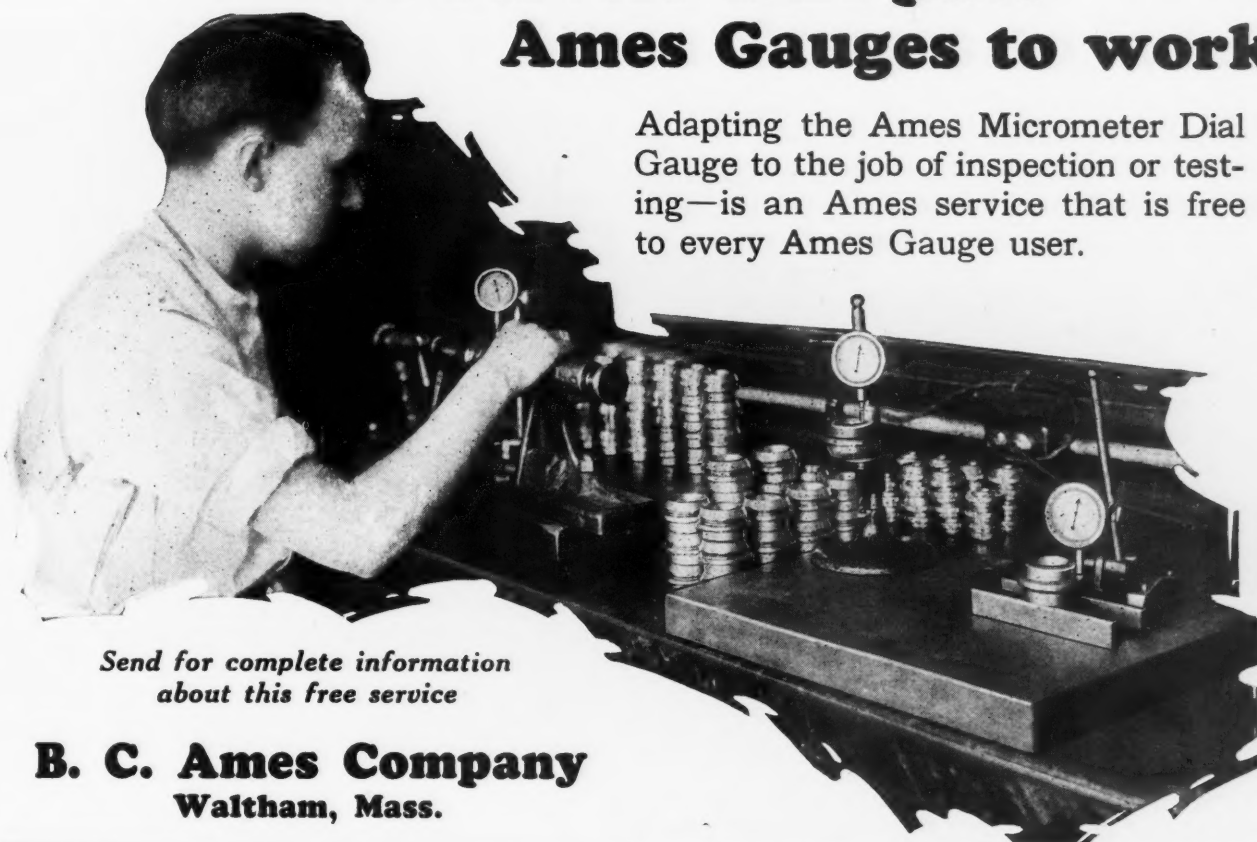
Sold by
Dealers
or
Direct

WALLACE BROS.
160 N. Wells St. CHICAGO, ILL.



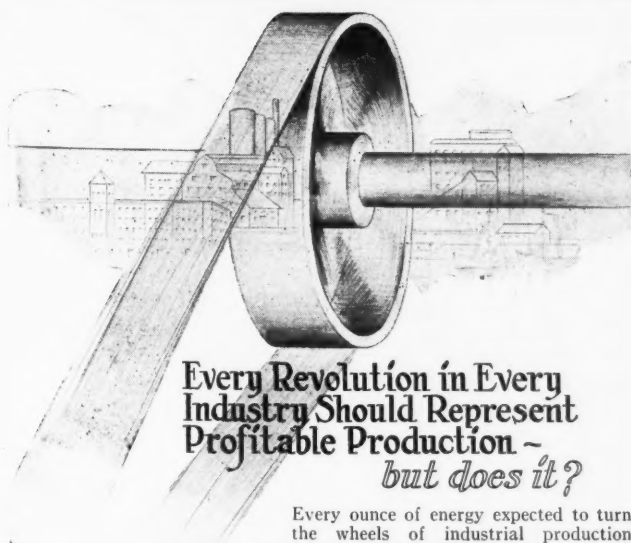
A Service that puts Ames Gauges to work

Adapting the Ames Micrometer Dial Gauge to the job of inspection or testing—is an Ames service that is free to every Ames Gauge user.



Send for complete information
about this free service

B. C. Ames Company
Waltham, Mass.



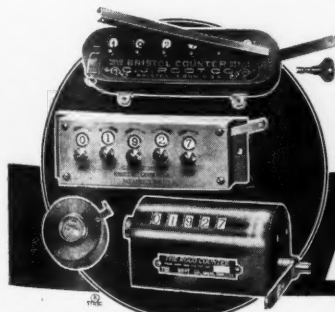
**Every Revolution in Every
Industry Should Represent
Profitable Production—
*but does it?***

Every ounce of energy expected to turn the wheels of industrial production whether mechanical or human, should present actual profit.

How often is your production many revolutions behind in actual tally and many revolutions ahead in the reports of your piece workers.

Ask for our text book "Counterology" on your Company stationery.

THE ROOT CO.
108 Chidsey St., Bristol, Conn.
Offices and distributors in most
of the principal cities.



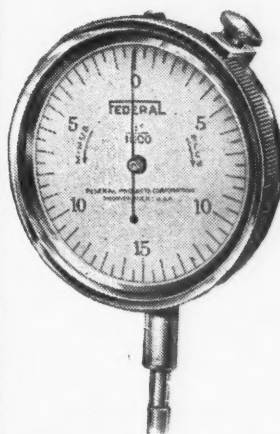
ROOT
COUNTERS

Just a few of our many Industrial Counters

FEDERAL

DIAL INDICATORS

Retain their Accuracy



Wide range of types and special gaging devices covers every gaging need. Send for Catalog.

Federal Dial Indicators stand the hard knocks of intensive production because they are differently made than other dial indicators. The movement has a top and bottom plate which provides perfect rigidity—jewelled bearings resist wear and protect accuracy. Federal Indicators are dependable and seldom require repairs.

FEDERAL Products Corp.

Providence, Rhode Island

Draw on Their Delay-Allowance

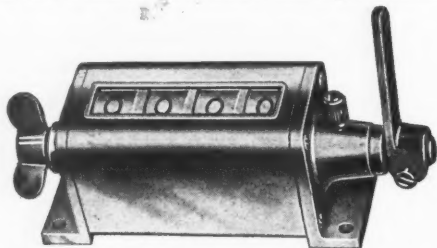
Late starting, early quitting, "washing up," waiting for materials:—what a drain on productive time. What a big *delay-allowance* to draw on!

Your machine-hands can save one-third of the time-waste if given incentives to tend to *work*. This, without undue fatigue.

Start your work-incentive plan with individual production-records. For the one thing that *holds* the worker's attention is the status of his production-record on a

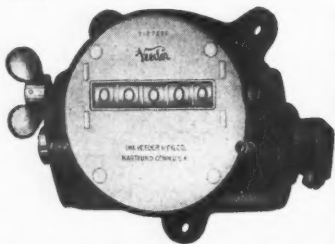
Veeder COUNTER

The *Revolution Set-Back Counter* below records the output of any machine where a shaft-revolution indicates an operation.



Sets back to zero from any figure by turning knob once round. Supplied with from four to ten figure-wheels, as required. Price, with four figures, as illustrated, \$10.00—subject to discount. Large Set-Back Rotary Ratchet Counter to count reciprocating movements where these count the product, \$11.50 (list). Cut $\frac{1}{2}$ size.

Here's the specialized Punch Press Counter; a heavy-cased ratchet mechanism, immensely durable.



Built especially for recording the product of heavy duty machinery where a reciprocating movement registers an operation. Strong stops limit the movement of the lever to 45 degrees or $\frac{1}{8}$ turn, which registers one on the dial. The large legible figures are easily read ten

feet away. Counter is regularly furnished with five figure-wheels and may be *set back to zero* by one turn of knob. Requires no special fixtures for attaching. Price, \$18.00. (Cut less than $\frac{1}{3}$ size).

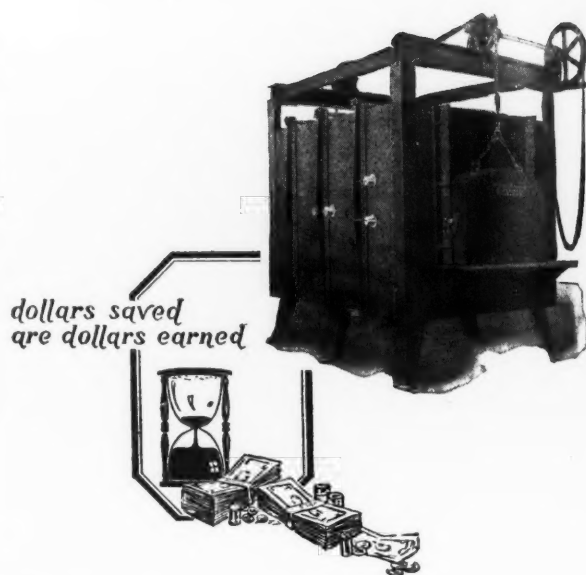
Write for the full-line *Veeder Booklet*

The Veeder Mfg. Co.

39 Sargeant Street, Hartford, Conn.

Middle West Distributor
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549 Washington Blvd.
CHICAGO, ILL.

Pacific Coast Distributor
F. SOMERS PETERSON CO.
57 California St.
SAN FRANCISCO, CAL.



It Pays To Use SC&H Electric Oven Furnaces

FREQUENTLY we receive reports from the various users of SC&H electric oven furnaces like the following: "Operating costs are lower"; "Production has been increased"; "Heat treatment is uniform, with no rejections."

The savings that are being realized by these many users are the result of the even distribution of heat, automatic control, and the efficient arrangement of the working space in the heating chamber, which are common to all SC&H electric oven furnaces.

How much your production can be speeded up—What savings you can make with SC&H electric oven furnaces can definitely be determined if you will send us your heat treating problem. There is no obligation on your part.

THE STRONG, CARLISLE &
HAMMOND COMPANY
CLEVELAND, OHIO

SC&H Industrial Furnaces

MFRS SC&H Electric, Oil and Gas Industrial Furnaces for: Annealing; Carburizing; Forging; Hardening; Heating; Oil tempering; Plate heating; Spring heating and Melting soft metals.

FURNACE ROOM ACCESSORIES

No Salt, No Oil, No Extra Cleaning—
WHEN YOU TEMPER WITH

HOMO

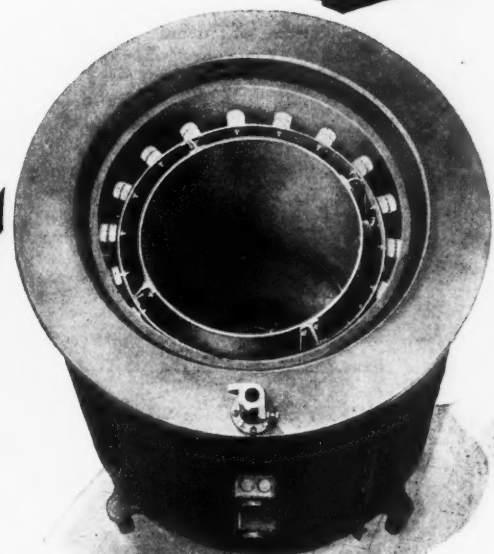
The Electric Tempering Furnace For Production

Homo is practically perfect for tempering production work.

It heats by forced convection, using electricity and air—the cleanest, quickest means for generating controlled heat and for carrying it to the work uniformly.

It is used in widely varied industries, and has proved not only that it makes possible ideal tempering, but that it is clean, convenient, positive and economical. It gives complete control and practically perfect uniformity.

We can probably tell you just what to expect of Homo in your plant.



Top view of Homo furnace, showing heating unit on insulators. In the bottom is seen a part of the reversing fan that forces heated air to and fro through the work. Note the cylindrical shield to protect the work from radiated heat.

Write us regarding your problem and ask for
Homo Tempering Catalog 93-Y.



LEEDS & NORTHRUP, COMPANY
4901 STENTON AVENUE, PHILADELPHIA



LEEDS & NORTHRUP

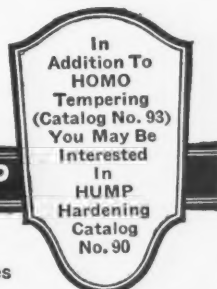
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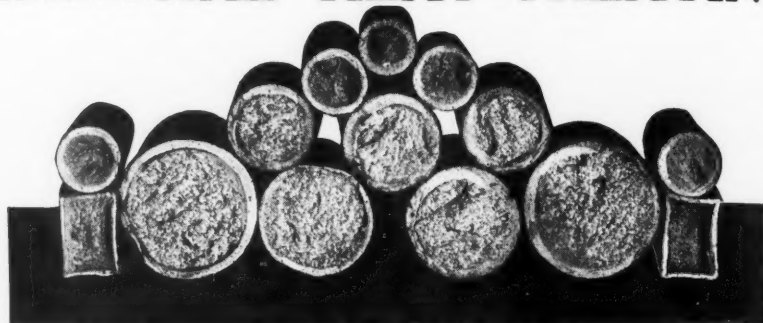
Los Angeles



WE DO COMMERCIAL HEAT-TREATING

including—

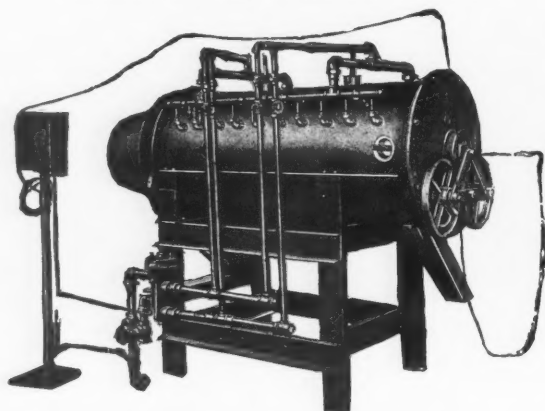
CASE-HARDENING
HARDENING
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GUN METAL
COLORING, ETC.



AMERICAN METAL TREATMENT CO.

Spring and Lafayette Streets
ELIZABETH, N. J.

For Automatically Heat Treating Bolts, Nuts, Washers, etc.



No. 136 Heating Machine with Automatic Heat Controller capacity for hardening or annealing 200 pounds per hour.

Capacity of No. 139 Heating Machine (same style as No. 136 but larger) 1000 pounds per hour.



Uniform heat treatment
at low cost per pound.
Write for complete in-
formation.

AMERICAN GAS
FURNACE CO.

Elizabeth New Jersey

Reliance Motors represent the ex-
perience of users plus our 21
years of experience in
building good motors.
We build both
D.C. and A.C.
Motors.

RELiance ELECTRIC & ENGINEERING CO
1056 Ivanhoe Road Cleveland, O
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Type T Heavy Duty
RELiance MOTORS
Direct Current

Distinctive Etched Name Plates

All Purposes

All Metals

Let us submit a design of character and originality
for your new name plate, or quote on your present
requirements.

CONNECTICUT NAME PLATE WORKS

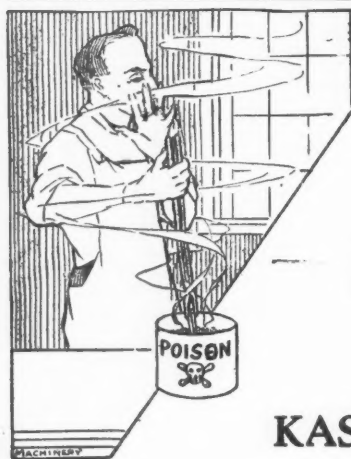
275 Noble Ave., Bridgeport, Conn.

"HEAT-EASY" Compound

Prevents Scaling and Distortion in Hardening
HIGH SPEED STEEL

Also, We Furnish Skilled Hardening Service of every
kind with results absolutely guaranteed

THE BENNETT METAL TREATING COMPANY, Elmwood, Conn.



➔ AVOID THIS BY USING

KASENIT

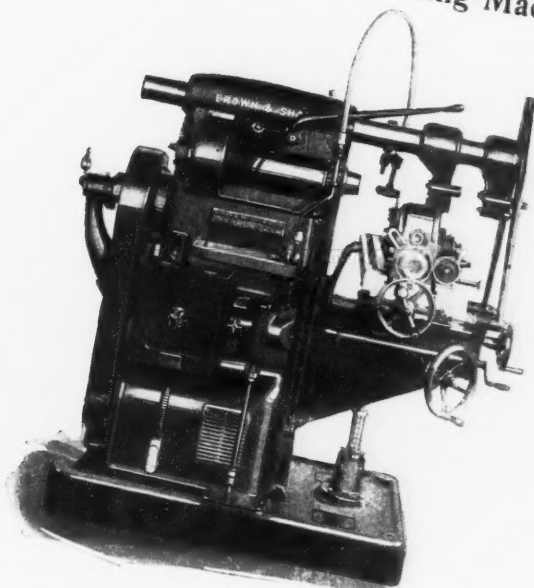
THE PERFECT CASE HARDENING COMPOUND
Non-Poisonous, Non-Explosive and Non-Inflammable

Write for FREE sample can, also for booklet "M"—valuable for its
suggestions, recommendations, tables, etc. Ask your dealer.

KASENIT COMPANY, 122 Greenwich St., New York

electrified

BROWN & SHARPE MFG. CO.
Providence, R. I., U S. A.
No. 2A Universal Milling Machine



PROGRESSIVE machine tool designers are effectively meeting the demands for modern, electrified equipment—as is shown in this milling machine completely equipped with G-E Motors and Control, an integral part of the machine.

In addition to the advantages of built-in motor drive, note the compact control arrangement on this machine with push-button station convenient to the operator.

G-E push-button control, with temperature overload relay, stops the motor *only* when it is dangerously heated—otherwise it keeps the machine on “full time.”

More and more, manufacturers are working with G-E machine tool specialists in putting G-E Motors and G-E Control on their machines.

Specify G-E Motorized Power and you get a modern electrified machine.



Motorized Power
—fitted to every need

200-63

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY N. Y., SALES OFFICES IN PRINCIPAL CITIES



*Don't pet them—
Forget them!*

VALLEY MOTORS don't have to be petted and coddled like a nervous child or a temperamental grand opera star. The hardened steel ball bearings require little or no attention. Many users clean and oil the bearings only once a year.

The rest of the time Valley Motors just keep right on working—proving to their owners that they cost less to operate and do more.

Polyphase $\frac{1}{4}$ to 40 h. p., and Single Phase $\frac{1}{4}$ to 3 h. p. Write for descriptive bulletin.

VALLEY ELECTRIC CO., ST. LOUIS, MO.

District Offices: Boston, Chicago, Indianapolis, Kansas City, Minneapolis, New York, Philadelphia, Cleveland, San Francisco

Valley

A Complete Line of Compressed Air Machinery

AIR COMPRESSORS

Any Capacity
Any Pressure
Any Drive
Stationary
Portable
Turbo Blowers

PNEUMATIC TOOLS

Pneumatic Drills
Riveting Hammers
Chipping Hammers
Pneumatic Grinders
Air Motor Hoists
Sand Rammers
Tie Tamers
Paving Breakers
Clay & Trench Diggers
Utility Hoists

ROCK DRILLS

"Jackhammer" Drills
"Stoppers"
Drifters
Sharpeners
Furnaces
Hoists

Other Products

COMPRESSORS

Ammonia
Gas
Gasoline Extraction

PUMPS

Cameron Sinks
Cameron Drainage
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Dry Vacuum
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our display adver-
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INGERSOLL-RAND COMPANY — 11 BROADWAY, NEW YORK, N. Y.
A. S. CAMERON STEAM PUMP WORKS
Offices in Principal Cities the World Over

FOR CANADA REFER — CANADIAN INGERSOLL-RAND CO. LIMITED 150 ST. JAMES ST. MONTREAL QUEBEC

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CHATILLON Springs



*For Service and
Durability*

Designed and manu-
factured for the work
required of them.

"For 90 years Spring
Manufacturers."

Let us go into your
Spring Requirements.

Send for Booklet "Helical Springs"

JOHN CHATILLON & SONS

Established 1835

99 Cliff Street, New York, N. Y.

2401

Pop asks how it happened



"Here, Lad—

if you would spend more time looking after the motors that we've got and less time trying to have me get this new-fangled motor the next time I buy—we wouldn't have to be arguing here about the amount of money it costs us to keep motors going. How does it happen that this motor of yours suddenly becomes a world beater?"

"Easy, Pop—

it didn't happen. The best things *never* happen—they're achieved.

The "Linc-Weld" people didn't happen on bearings and shafts that are bigger than those of any other motor.

Being motor specialists they knew years ago that these items cause the most trouble in motor operation—so they deliberately developed these to a point where these troubles were licked.

By accurate logging of our motor shutdowns, 75% were directly the result of bearing failure.

So I'm simply asking you, Pop, to look at these two bearings—

The little fellow is ours—the big brute is the "Linc-Weld", and tell me which you'd choose if your life and not your prejudices were at stake on the final outcome in service?"

The Lincoln Electric Co., Dept. No. 7-8, Cleveland, Ohio

MA-19

L *"Linc-Weld"*
INCOLN MOTOR

MACHINERY, August, 1927—259

MACHINERY'S GREEN SECTION

Buying from PRENTISS Means Taking the Unknown Quality Out of Used Machine Tools

BORING MILLS

24" Bullard New Era.
No. 1 Lucas Horizontal Boring S.P.D.
thru gear box.
96" Cincinnati Rapid Production.
102" J. M. Poole.

DRILLS

No. 3/4—2 spindle Avey B. B. Bench.
No. 25 Foote-Burt H. D.
20" W. F. J. Barnes Stationary Head
Drill.
24" Cincinnati-Bickford Upright.
25" Weigel Upright.
32" Cincinnati-Bickford Upright.
32" Aurora Upright.
4" Carlton Plain Radial.
42" Cincinnati-Bickford Upright.
5" Dreses Plain Radial, S.P.D.
6" Cincinnati-Bickford Plain Radial,
S.P.D.
Nos. 14 and 30 Natco Multiple Spindle.

GRINDERS

3", 6" and 10" Norton Plain.
12" x 36" Cincinnati Universal.
No. 2 Norton Cutter and Tool.
No. 65 Heald Cylinder.
No. 16 Blanchard Vertical Surface M.D.
14" Pratt & Whitney Vertical Surface.
No. 1 Cincinnati Universal Cutter and
Tool Grinder.

The above items are only a
small part of our stock.
Complete list on request.

Yes, we BUY tools for stock.
Also make exchanges. What
have you to offer?

SHAPERS

16" Cincinnati Cone.
20" American S.P.D.
20" Stockbridge Cone.
24" Cincinnati Cone.

MILLERS

Nos. 2, 3 and 4 Cincinnati H. P. Plain.
No. 2 1/2 Leblond Plain.
No. 3 Kempsmith Plain.
No. 4B Brown & Sharpe Plain.
No. 1 Kempsmith Universal.
No. 2 Hendey Universal.
No. 3 Hendey H. P. Universal.
No. 3 Cincinnati Vertical Power Rapid
Traverse.
No. 4 Cincinnati Vertical.
No. 2-B Kearney & Trecker Universal
Miller.

PLANERS

24" x 6' Wilson.
24" x 6' Ohio.

UNUSUAL:

New 36" x 36" x 26" Cincinnati Hydro Planer,
two heads on cross rail, two side heads arranged
for reversible motor drive. Write for descrip-
tive circular and price.

LATHES

14" x 6' Hendey, Cone Head.
14" x 10' Lodge & Shipley Sel.
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16" x 6' Lodge & Shipley Sel.
Geared Hd.
16" x 7' Lodge & Shipley Cone Head.
18" x 8' Prentice Bros. Geared Head.
30" x 12' Lodge & Shipley Cone and
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1 1/2" x 9" Acme Wire Feed.
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6" Gleason Gear Generator.
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15" x 8' Sidney, Q.C.G., D.B.G.
16" x 8' Bradford, Q.C.G., D.B.G.
18" x 8' American, Geared Head, M.D.
18" x 10' Whitcomb-Blaisdell, G.H., S.P.D.
20" x 10' Hendey, Geared Head, M.D.
20" x 12' Hendey Tool Room.
20" x 12' Schumacher & Boye, Q.C.G., D.B.G.
24" x 10' Whitcomb-Blaisdell, G.H., M.D.
24" x 12' Boye & Emmes, Q.C.G., D.B.G.
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34" x 12' LeBlond Triple Geared Turret.

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No. 20 Bliss, O.B.I. Flywheel.
No. 380 Stoll Horning.
DD-2 Ferracute Double Acting, 25 Ton.
No. 54 Toledo Trimming, Side Shear.
30 Ton Lucas Forcing Press.

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No. 1 Knight Milling & Drilling.
No. 1 1/2 American Plain.
No. 3 Kempsmith Plain—Vert. Att.
No. 4 Hendey Plain—S.P.D.
No. 7-H Becker Manufacturing Type.
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12" x 24" Modern Plain, Arr. M.D.
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Phase, 60 Cycle—3600 R.P.M.
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No. 16 Besly Wheel Grinder.

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30" x 30" x 12' Gray—1 Head.
36" x 36" x 8' Cincinnati—Head.
36" x 36" x 10' Detrick & Harvey Openside.
48" x 48" x 12' Betts—3 Heads.
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20" Whipp Back Geared Crank Shaper.
24" Cincinnati B.G. Crank Shaper—M.D.

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30" Bullard Vertical Boring Mill.
34" Colburn Vertical—1 Head.
42" Bullard Vertical—2 Heads—M.D.
51" Niles Vertical—2 Heads.
62" Bullard Vertical—2 Heads.
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25" Superior—S.H.—B.G. Drill.
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6" Prentice Plain Radial Drill.
6" Bickford Plain Radial Drill.

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No. 3-A Royersford D.E., Cap. 1" x 1/4".
Arch. Jaw, 18" Throat.
Wickes Punch, 48" Throat, Cap. 1 1/4" x 1".
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16" x 8' National, Q.C., 3-step cone..	350
20" x 12' Hendey, Q.C., 4-step cone, taper, yoke head	1200
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24" x 10' Boye & Emmes, Q.C., 3-step cone	850
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4' Bickford Radial, single pulley dr...	850
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No. 3-B Heavy Brown & Sharpe, single pulley	1100
No. 3 Brown and Sharpe Universal....	1000
No. 3 Brown and Sharpe Vertical, single pulley	850
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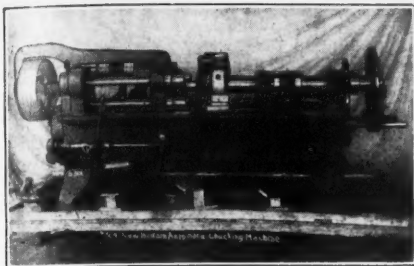
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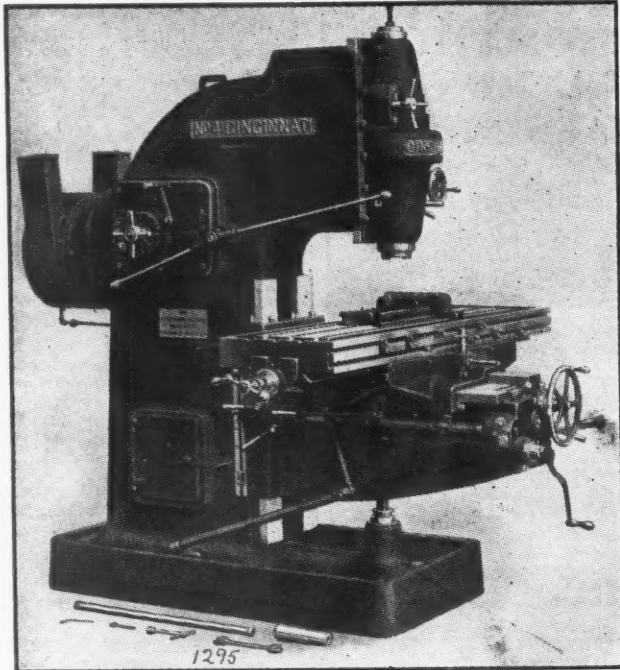
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- 26" Reed-Prentice Upright Drill, G.B.D.
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- 24" Barnes All Geared Drill Press.
- 22" Aurora Upright Drill Press, Tap. Attach.
- 20" Barnes All Geared Drill Press, Self Oiling.
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- 2 Spindle Edlund Ball Bearing Drill Press.
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- No. 12-26" Besley Disc Grinder.
- No. 120 Gardner B. B. Double Disc Grinder.
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MISCELLANEOUS

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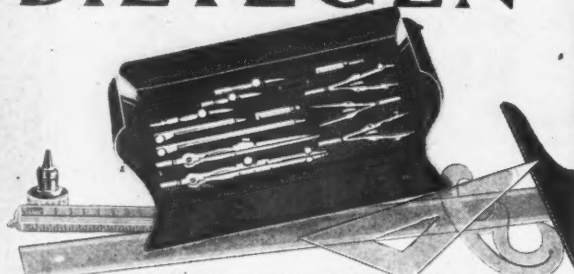
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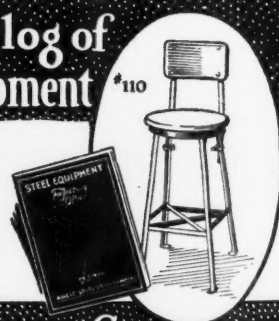


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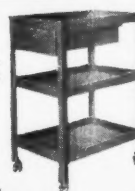
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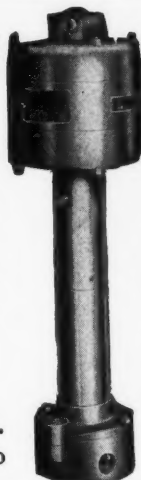
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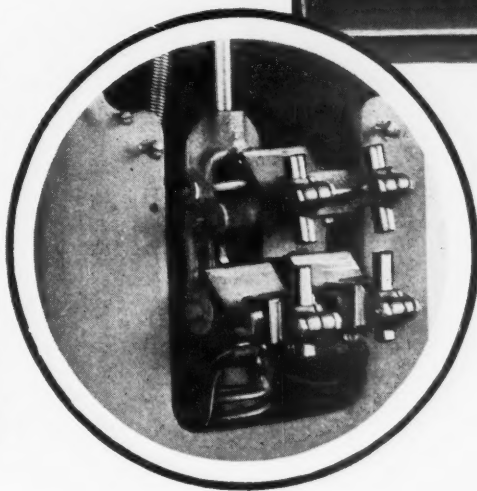
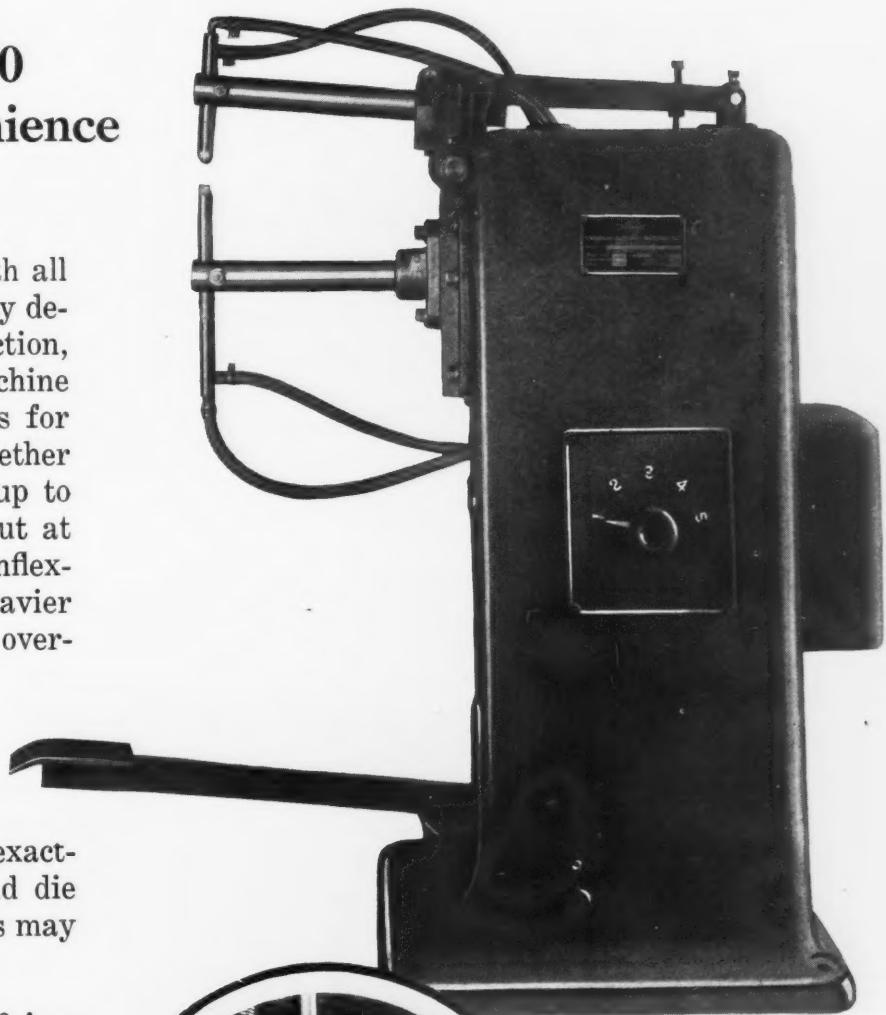
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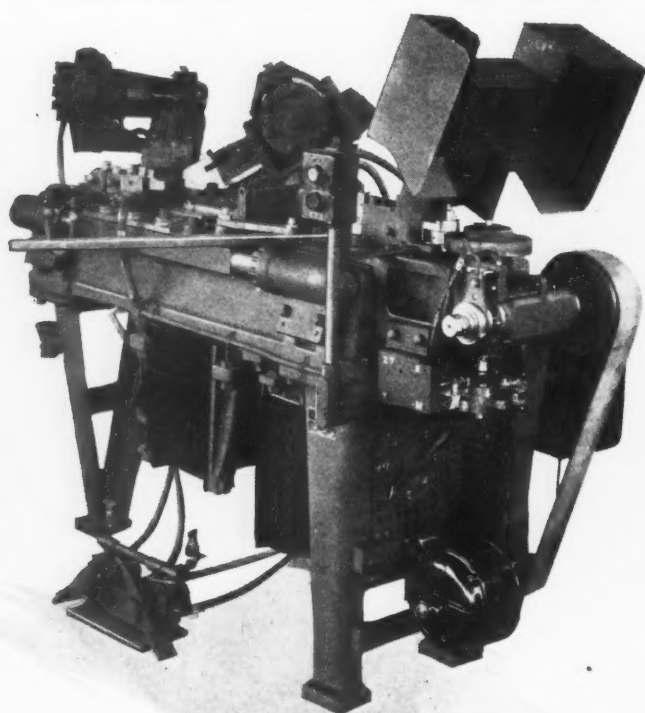
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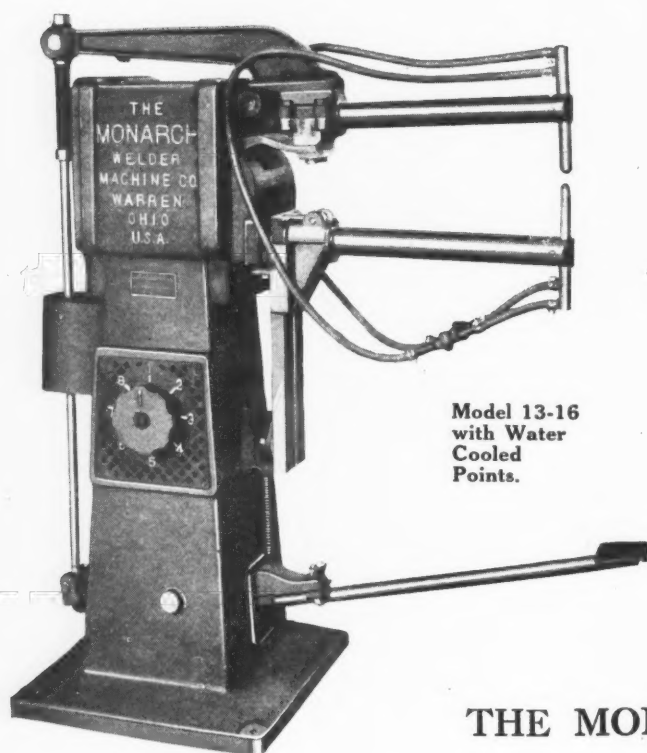
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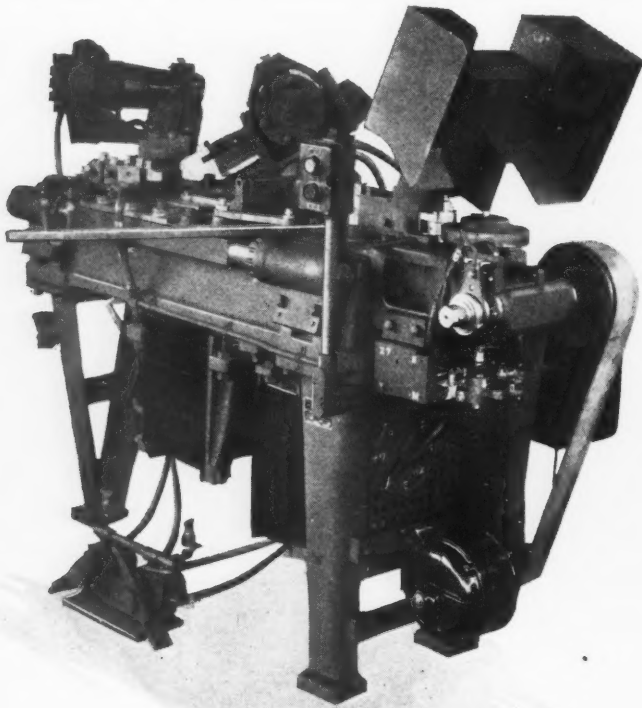
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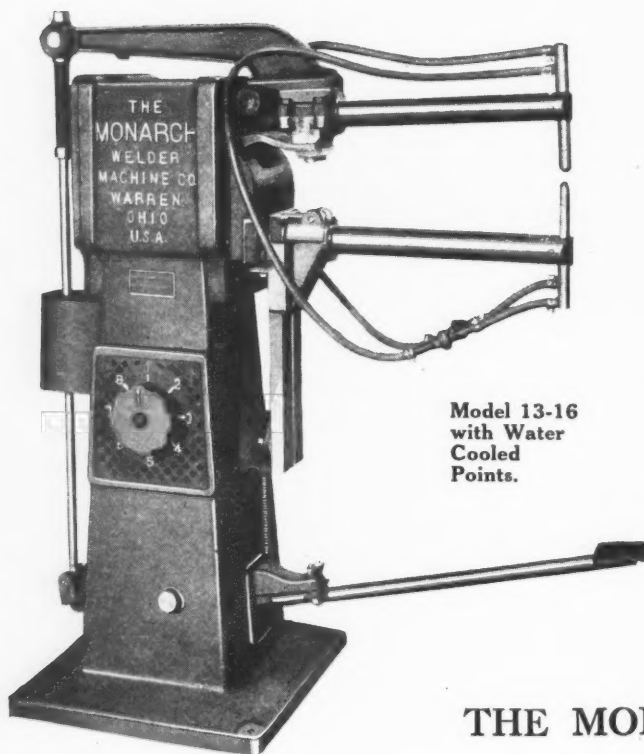
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Graton & Knight Mfg. Co., Worcester, Mass.

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Brown & Sharpe Mfg. Co., Providence, R. I.
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Standard Pressed Steel Co., Jenkintown, Pa.

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Wickes Bros., Saginaw, Mich.

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Watson-Stillman Co., 73 West St., New York City.

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General Electric Co., Schenectady, N. Y.
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BLUEPRINT PAPER

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Ryerson & Son, Joseph T., 2558 W. 16th St., Chicago.

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Ajax Mfg. Co., Cleveland.
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Landis Machine Co., Inc., Waynesboro, Pa.
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Cochrane-Bly Co., Rochester, N. Y.
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Sellers & Co., Inc., Wm., Philadelphia.

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Williams, J. H., Co., Buffalo, N. Y.

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Morse Twist Drill & Mch. Co., New Bedford, Mass.
O. K. Tool Co., Inc., Shelton, Conn.
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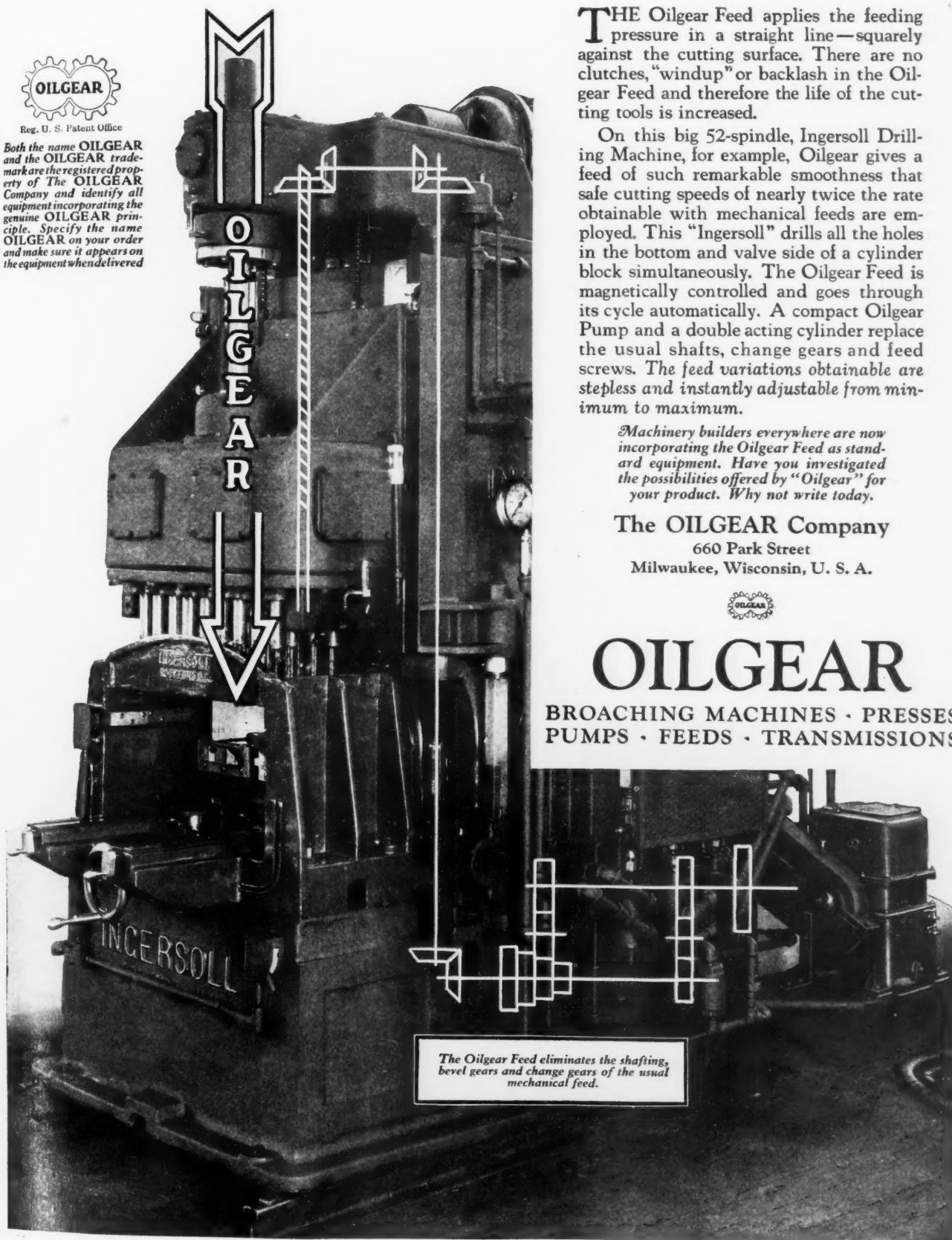
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Besly & Co., Chas. H., 120-B N. Clinton St., Chicago.
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Niles-Bement-Pond Co., 111 Broadway, New York.
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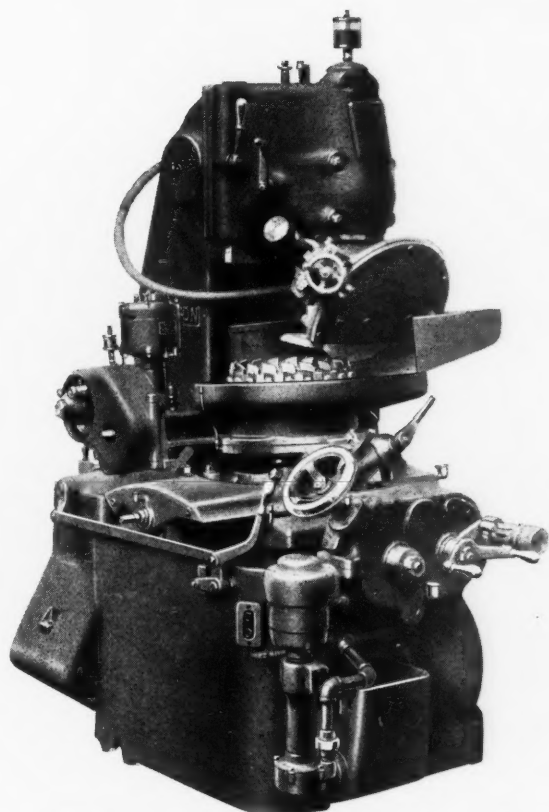
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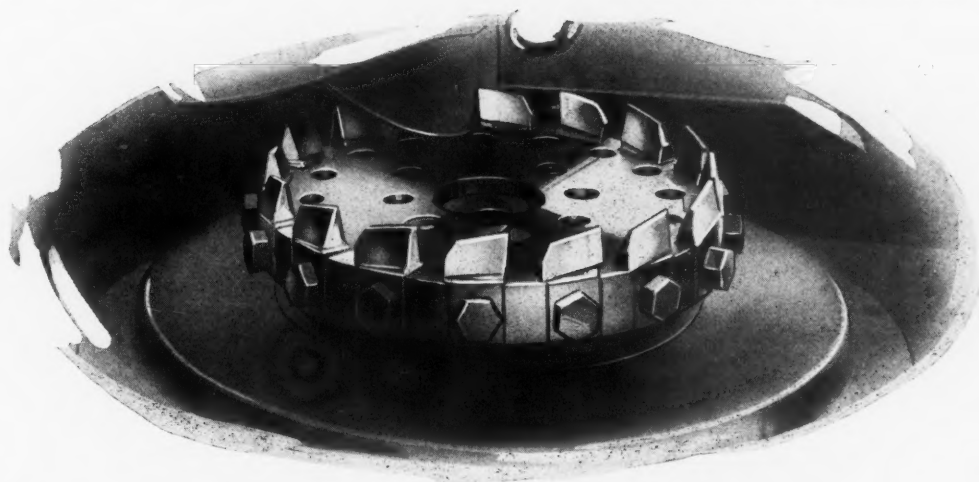


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This machine is a valuable addition to any Spiral Bevel or Hypoid gear cutting equipment. It was especially developed for sharpening Spiral Bevel and Hypoid Gear Cutters used on the Gleason Spiral Bevel Roughers and Generators. The cutter holder accommodates the 6, 9 and 12-inch cutters.

An exceptionally good finish is obtained as the grinding wheel has a line contact with the cutting blades, grinding on the conical side of the wheel (See Illustration below). This decreases considerably the possibility of burning the blades as there is no tendency for the wheel to glaze. A cool even temperature is maintained by means of a water coolant pumped over the grinding surface of the wheel.

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Taylor-Shantz Co., Rochester, N. Y.
U. S. Tool Co., Inc., Ampere, N. J.
V & O Press Co., Hudson, N. Y.
Wade Tool Co., Waltham, Mass.
Wicaco Screw & Mch. Works, Inc., Philadelphia.
- CONTROLLERS**
Allen-Bradley Co., 499 Clinton St., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Reliance Electric & Eng. Co., 1056 Ivanhoe Road, Cleveland.
- CONVEYORS, BELT**
Industrial Conveyor Co., Keyport, N. J.
Link-Belt Company, Chicago.
- COTTER PINS**
Williams, J. H., & Co., Buffalo, N. Y.
- COUNTERBORES**
Cleveland Twist Drill Co., Cleveland.
Eclipse Interchangeable Counterbore Co., Detroit.
Gairing Tool Co., Inc., Detroit.
Illinois Tool Wks., 2501 N. Keeler Ave., Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Tool Co., Cleveland.
National Twist Drill & Tool Co., Detroit, Mich.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.
Starrett Co., L. S., Athol, Mass.
Threadwell Tool Co., Greenfield, Mass.
Union Twist Drill Co., Athol, Mass.
- COUNTERSHAFTS, FRICTION, ETC.**
Bardons & Oliver, Cleveland.
Brown Co., A. & F., 79 Barclay St., New York.
Brown & Sharpe Mfg. Co., Providence, R. I.
Diamond Mch. Co., Providence, R. I.
Edgemont Machine Co., 2700 National Ave., Dayton, Ohio.
Falls Clutch & Mch. Co., Kent, Ohio.
Gisholt Machine Co., 1300 E. Washington Ave., Madison, Wis.
Hilliard Clutch Corp., Elmira, N. Y.
Jones Foundry & Mch. Co., W. A., 4409 W. Roosevelt Rd., Chicago.
LeBlond Mch. Tool Co., R. K., Cincinnati, O.
Wood's T. B. & Sons Co., Chambersburg, Pa.
- COUNTERSINKS**
Coppdill Mfg. Co., Detroit.
Eclipse Interchangeable Counterbore Co., Detroit.
Gairing Tool Co., Inc., Detroit.
Greenfield Tap & Die Corp., Greenfield, Mass.
- COUNTERS, REVOLUTION**
Bristol Co., Waterbury, Conn.
Root Co., Bristol, Conn.
Starrett Co., L. S., Athol, Mass.
Veeder Mfg. Co., 39 Sargeant St., Hartford, Conn.
- COUPLERS, ROSE**
Greene, Tweed & Co., 109 Duane St., New York.
- COUPLINGS, CUT-OFF FRICTION**
Conway Clutch Co., Cincinnati, O.
Edgemont Machine Co., 2700 National Ave., Dayton, Ohio.
Falls Clutch & Mch. Co., Kent, Ohio.
Johnson Machine Co., Carlyle, Manchester, Conn.
Medart Co., St. Louis, Mo.
Wood's T. B. & Sons Co., Chambersburg, Pa.
- COUPLINGS, FLEXIBLE**
Boston Gear Wks. Sales Co., Norfolk Downs, Quincy, Mass.
Brown Engineering Co., 133 No. 3rd St., Reading, Pa.
- Foot Bros. Gear & Mch. Co., 232-242 N. Curtis St., Chicago.
James Mfg. Co., D. O., 1120 W. Monroe St., Chicago, Ill.
Jones Foundry & Mch. Co., W. A., 4409 W. Roosevelt Rd., Chicago.
Medart Co., St. Louis, Mo.
Nicholson & Co., W. H., 112 Oregon St., Wilkes-Barre, Pa.
Nuttall, R. D., Co., Pittsburgh, Pa.
Philadelphia Gear Works, Philadelphia, Pa.
Smith & Serrell, Newark, N. J.
Wood's T. B. & Sons Co., Chambersburg, Pa.
- COUPLINGS, PIPE**
Dart Mfg. Co., E. M., Providence, R. I.
- COUPLINGS, SHAFT**
Adamson Mch. Co., Akron, O.
Boston Gear Works Sales Co., Norfolk Downs, Quincy, Mass.
Brown Co., A. & F., 79 Barclay St., New York.
Brown Engineering Co., 133 N. Third St., Reading, Pa.
Falls Clutch & Mch. Co., Kent, Ohio.
Foot Bros. Gear & Mch. Co., 232-242 N. Curtis St., Chicago.
Hilliard Clutch Corp., Elmira, N. Y.
Link-Belt Co., Chicago, Ill.
Medart Co., St. Louis, Mo.
Moore & White Co., 2707-2737 No. 15th St., Philadelphia.
Nicholson & Co., W. H., 112 Oregon St., Wilkes-Barre, Pa.
Roversford Fdry. & Machine Co., Box M., Roversford, Pa.
Sellers & Co., Inc., Wm., Philadelphia.
Smith & Serrell, Newark, N. J.
Smith, Winfield H., 116 Eaton St., Springfield, N. Y.
Wood's T. B. & Sons Co., Chambersburg, Pa.
- CRANES, ELECTRIC TRAVELING**
Link-Belt Company, Chicago.
Niles-Bement-Pond Co., 111 Broadway, New York.
Reading Chain & Block Corp., Reading, Pa.
Roeper Crane & Hoist Works, Reading, Pa.
Shepard Elec. Crane & Hoist Co., 380 Schuyler Ave., Montour Falls, N. Y.
- CRANES, HAND TRAVELING**
Hanna Engineering Works, 1763 Elston Ave., Chicago.
Harrington Co., Philadelphia, Pa.
Niles-Bement-Pond Co., 111 Broadway, New York.
Reading Chain & Block Corp., Reading, Pa.
Roeper Crane & Hoist Works, Reading, Pa.
Shepard Elec. Crane & Hoist Co., 380 Schuyler Ave., Montour Falls, N. Y.
Yale & Towne Mfg. Co., Stamford, Conn.
- CRANES, LOCOMOTIVE**
Hanna Engineering Works, 1763 Elston Ave., Chicago.
Link-Belt Company, Chicago.
- CRANES, PORTABLE**
Canedy-Otto Mfg. Co., Chicago Heights, Ill.
Canton Fdry. & Mch. Co., Canton, O.
- CRANK PIN TURNING MACHINES**
American Tool Works Co., Cincinnati.
Lodge & Shipley Mch. Tool Co., Cincinnati.
Niles-Bement-Pond Co., 111 Broadway, New York.
Underwood Corp., H. B., Philadelphia.
- CRUCIBLES**
Dixon, Jos., Crucible Co., Jersey City, N. J.
- CUTTING COMPOUND**
See Compound, Cutting, Grinding, etc.
- CUTTERS, MILLING**
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., Cleveland.
Columbus Die, Tool & Mch. Co., Columbus, O.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cowles Tool Co., Cleveland, Ohio.
Gammons-Holman Co., Manchester, Conn.
Goddard & Goddard Co., Detroit.
Gould & Eberhardt, Newark, N. J.
Haynes Stellite Co., 30 E. 42nd St., New York.
Illinois Tool Wks., 2501 N. Keeler Ave., Chicago, Ill.
Ingersoll Milling Mch. Co., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Lorejoy Tool Co., Inc., Springfield, Vermont.
Modern Tool Wks., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Tool Co., Cleveland.
National Twist Drill & Tool Co., Detroit, Mich.
Newark Gear Cutting Machine Co., Newark, N. J.
O. K. Tool Co., Inc., Shelton, Conn.
Pratt & Whitney Co., Hartford, Conn.
Reed-Prentice Corp., Worcester, Mass.
Standard Tool Co., Cleveland.
- Tabor Mfg. Co., Philadelphia, Pa.
Union Twist Drill Co., Athol, Mass.
Whitney Mfg. Co., Hartford, Conn.
- CUTTING-METALS OR ALLOYS**
Haynes Stellite Co., 30 E. 42nd St., New York.
- CUTTING-OFF MACHINES, ABRASIVE WHEEL**
Armstrong Bros. Tool Co., 313 North Francisco Ave., Chicago.
Greenfield Tap & Die Corp., Greenfield, Mass.
- CUTTING-OFF MACHINES, COLD SAW**
See Sawing Machines, Circular.
- CUTTING-OFF MACHINES**
Bardons & Oliver, Cleveland.
Brown & Sharpe Mfg. Co., Providence, R. I.
Curtis & Curtis Co., 324 Garden St., Bridgeport, Conn.
Etna Machine Co., Toledo, O.
Hurlbut, Rogers Mch. Co., Nashua, N. H.
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O. K. Tool Co., Inc., Shelton, Conn.
Pratt & Whitney Co., Hartford, Conn.
Ready Tool Co., Bridgeport, Conn.
Western Tool & Mfg. Co., Springfield, Ohio.
Williams, J. H., & Co., Buffalo, N. Y.
- CYLOMETERS**
Veeder Mfg. Co., 39 Sargeant St., Hartford, Conn.
- CYLINDER BORING MACHINES**
Baker Bros., Inc., Toledo, O.
Consolidated Machine Tool Corp., Rochester, N. Y.
Ingersoll Milling Mch. Co., Rockford, Ill.
Newton Machine Tool Works, Inc., Rochester, N. Y.
Niles-Bement-Pond Co., 111 Broadway, New York.
Sellers & Co., Inc., Wm., Philadelphia, Pa.
- CYLINDER BORING MACHINES, PORTABLE**
Underwood Corp., H. B., Philadelphia, Pa.
- DEALERS, MACHINERY**
Allen, H. F., Co., Inc., 30 Church St., New York.
Desly & Co., Charles H., 120-B No. Clinton St., Chicago.
DeWitt Tool Co., 244 Lafayette St., N. Y. C.
Earle Gear & Machine Co., 4707 Stenton Ave., Philadelphia.
Eastern Machinery Co., Cincinnati.
Essley Machinery Co., E. L., 551-57 W. Washington Blvd., Chicago.
General Machinery Co., 170 Summer St., Boston, Mass.
Jones Machine Tool Co., Cincinnati.
Lucas & Son, Inc., J. L., Bridgeport, Conn.
Miles Machinery Co., Saginaw, Mich.
Morey & Co., Inc., 404 Broome St., New York.
Niles-Bement-Pond Co., 111 Broadway, New York.
Osborne & Sexton Mch. Co., Columbus, Ohio.
Osgood Tool Co., J. L., Buffalo, N. Y.
Prentiss, Henry, & Co., Inc., Jersey City, N. J.
Ryerson & Son, Joseph T., 2558 W. 16th St., Chicago.
Wayne Mch. Co., Fort Wayne, Ind.
- DEMAGNETIZERS**
Heald Machine Co., 16 New Bond St., Worcester, Mass.
J. & H. Electric Co., Providence, R. I.
Luma Electric Equipment Co., Toledo, Ohio.
Walker Company, Inc., O. S., Worcester, Mass.
- DESIGNERS, MACHINE AND TOOL**
Manufacturers' Consulting Engineers, Syracuse, N. Y.
Ruthman Mchry. Co., Cincinnati, Ohio.
- DIAMONDS AND DIAMOND TOOLS**
Desmond-Stephan Mfg. Co., Urbana, O.
Francis & Co., Hartford, Conn.
- DIE BLOCKS**
Dyson & Sons, Joseph, Cleveland, O.
- DIE CASTINGS**
See Castings, Die or Die Molded.
- DIE CUSHIONS, DEEP DRAWING PNEUMATIC**
Marquette Tool & Mfg. Co., 321 West Ohio St., Chicago.
- DIE FORMING MACHINE**
Anderson Die Machine Co., Bridgeport, Conn.
- DIE MAKERS' SUPPLIES**
Danly Machine Specialties, Inc., 2112 S. 52nd Ave., Chicago.
U. S. Tool Co., Inc., Ampere, N. J.
- DIE SETS, STANDARD**
Danly Machine Specialties, Inc., 2112 S. 52nd Ave., Chicago.
U. S. Tool Co., Inc., Ampere, N. J.
- DIE SINKERS, AUTOMATIC**
Keller Mechanical Engineering Corp., 74 Washington St., Brooklyn, N. Y.
- DIE SINKING MACHINES**
Pratt & Whitney Co., Hartford, Conn.
Reed-Prentice Corp., Worcester, Mass.
- DIE STOCKS**
See Stocks, Dies.
- DIES, DROP FORGING**
Keller Mechanical Engineering Corp., 74 Washington St., Brooklyn, N. Y.
- DIES, DRAWING, PRESSURE ATTACHMENTS**
Marquette Tool & Mfg. Co., 321 West Ohio St., Chicago.
- DIES, LETTERING AND EMBOSING**
Noble & Westbrook Mfg. Co., Hartford, Conn.
Schwerdtle Stamp Co., Bridgeport, Conn.
- DIES, SHEET METAL, ETC.**
Adrian Machine Works, Inc., 78 Richards St., Brooklyn, N. Y.
American Tool & Mfg. Co., Urbana, O.
Bliss Co., E. W., Brooklyn, N. Y.
Columbus Die, Tool & Machine Co., Columbus, O.
Danly Machine Specialties, Inc., 2112 S. 52nd Ave., Chicago.
Ferracuta Machine Co., Bridgeport, N. J.
Globe Mch. & Stamping Co., 1255 W. 76th St., Cleveland, O.
Keller Mechanical Engineering Corp., 74 Washington St., Brooklyn, N. Y.
Loeffler, H. & Co., Newark, N. J.
Mehl Mch. Tool & Die Co., Roselle, N. J.
Peck, Stow & Wilcox, Southington, Conn.
Reliance Die & Stamping Co., 515 N. LaSalle St., Chicago.
Ruthman Mchry. Co., Cincinnati, Ohio.
Sinko Tool & Mfg. Co., 351 N. Crawford Ave., Chicago, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Taylor-Shantz Co., Rochester, N. Y.
Toledo Mch. & Tool Co., Toledo, O.
U. S. Tool Co., Inc., Ampere, N. J.
V & O Press Co., Hudson, N. Y.
Wade Tool Co., Waltham, Mass.
Waltham Machine Works, Waltham, Mass.
- DIES, THREADING**
Armstrong Mfg. Co., Bridgeport, Conn.
Brubaker & Bros., W. L., 50 Church St., New York.
Card Mfg. Co., S. W., Div. Union Twist Drill Co., Mansfield, Mass.
Carpenter Tap & Die Co., J. M., Pawtucket, R. I.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hardinge Bros., Inc., 4149 Ravenswood Ave., Chicago, Ill.
Jones & Lamson Mch. Co., Springfield, Vermont.
Landis Mch. Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, O.
Pratt & Whitney Co., Hartford, Conn.
Reed Mfg. Co., Erie, Pa.
Saunders' Sons, Inc., D., Yonkers, N. Y.
Standard Tool Co., Cleveland.
Threadwell Tool Co., Greenfield, Mass.
Winter Bros. Co., Wrentham, Mass.
- DIES, THREADING, OPENING**
Apex Machine Co., Dayton, O.
Consolidated Machine Tool Corp., Rochester, N. Y.
Eastern Machine Screw Corp., New Haven, Conn.
Errington Mechanical Laboratory, Broadway and John St., New York.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
H. & G. Works, Eastern Mch. Screw Corp., New Haven, Conn.
Jones & Lamson Mch. Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murphy Mch. & Tool Co., 34 Porter St., Detroit.
National Acme Co., Cleveland, O.
- DIES, THREAD ROLLING**
Hanson-Whitney Mch. Co., Hartford, Conn.
- DISCS, ABRASIVE**
Badger Tool Co., Beloit, Wis.
Besly & Co., Charles H., 120-B No. Clinton St., Chicago.
Carborundum Co., Niagara Falls, N. Y.

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They will cut your spur gears faster than you are cutting them now.

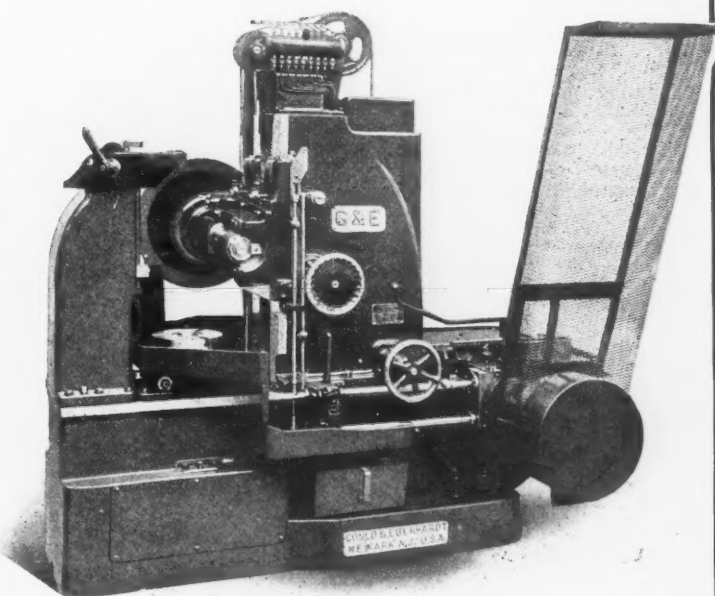
They will cut your cutter cost in half—by cutting more gears per sharpening of hob.

They will—in addition to these savings — produce more accurate work.

They will also cut chain sprockets and spline shafts with equal facility.

Let us prove that these savings can be made on your own work.

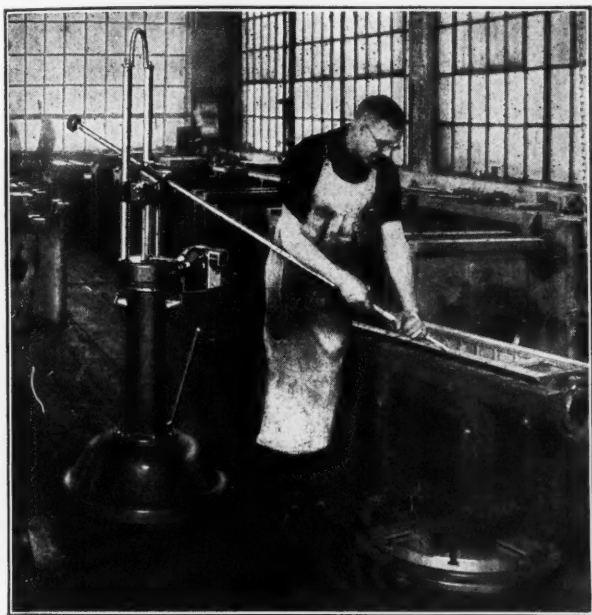
Gould & Eberhardt manufacturing hobbers are made in two sizes. 16 H.S. for gears to 18" diameter and 36 H.S. for gears to 42" diameter.



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Walls Sales Corp., 96 Warren St., New York City.
- DIVIDING HEADS**
LeBlond, R. K., Machine Tool Co., Cincinnati.
See also Milling Machines, Horizontal, Universal.
- DOWEL PINS**
Danly Machine Specialties, Inc., 2112 S. 52nd Ave., Chicago.
- DRAFTING MACHINES**
Dietzen, Eugene Co., 166 W. Monroe St., Chicago, Ill.
Universal Drafting Mch. Co., Cleveland, O.
- DRAWING BOARDS AND TABLES**
Dietzen, Eugene Co., 166 W. Monroe St., Chicago, Ill.
New Britain Mch. Co., New Britain, Conn.
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- DRAWING INSTRUMENTS AND MATERIALS**
Dietzen, Eugene Co., 166 W. Monroe St., Chicago, Ill.
- DRESSERS, GRINDING WHEEL**
Abrasive Co., Bridesburg, Philadelphia.
Bridgeport Safety Emery Wheel Co., Inc., 1283 W. Broad St., Bridgeport, Conn.
Calder Co., George H., Lancaster, Pa.
Cleveland Stone Co., Cleveland.
Desmond-Stephan Mfg. Co., Urbana, O.
Francis & Co., Hartford, Conn.
Norton Co., Worcester, Mass.
Reed Mfg. Co., Erie, Pa.
Ross Mfg. Co., Cleveland, Ohio.
Standard Tool Co., Cleveland, O.
Western Tool & Mfg. Co., Springfield, Ohio.
- DRIFTS, DRILL**
Armstrong Bros. Tool Co., 313 North Francisco Ave., Chicago.
Williams, J. H. & Co., Buffalo, N. Y.
- DRILL HEADS, MULTIPLE**
Baker Brothers, Inc., Toledo.
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Buhr Machine Tool Co., Ann Arbor, Mich.
Errington Mechanical Laboratory, Broadway and John St., New York.
Hoefler Mfg. Co., Freeport, Ill.
National Automatic Tool Co., Richmond, Ind.
Rockford Drilling Machine Co., Rockford, Ill.
United States Drill Head Co., 1948 W. 6th St., Cincinnati.
- DRILL SOCKETS**
Armstrong Bros. Tool Co., 313 North Francisco Ave., Chicago.
Cleveland Twist Drill Co., Cleveland.
Greenfield Tap & Die Mch. Co., New Bedford, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit, Mich.
Scully-Jones & Co., 13th and Robey Sts., Chicago.
Standard Tool Co., Cleveland.
Union Twist Drill Co., Athol, Mass.
- DRILL SPEEDERS**
Graham Mfg. Co., Providence, R. I.
Hoefler Mfg. Co., Freeport, Ill.
- DRILL STANDS**
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Standard Tool Co., Cleveland.
- DRILLING AND MILLING MACHINES, VERTICAL**
Buhr Machine Tool Co., Ann Arbor, Mich.
Moline Tool Co., Moline, Ill.
- DRILLING MACHINES, AUTOMATIC**
Avey Drilling Machine Co., Cincinnati.
Baker Bros., Inc., Toledo, Ohio.
Barnes Co., W. F. & John, 231 Ruby St., Rockford, Ill.
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Buhr Machine Tool Co., Ann Arbor, Mich.
Cincinnati Automatic Mch. Co., Cincinnati.
Grant Mfg. & Mch. Co., N. W. Station, Bridgeport, Conn.
Hoefler Mfg. Co., Freeport, Ill.
Kingsbury Mch. Co., Keene, N. H.
Millholland Sales & Engineering Co., Indianapolis, Ind.
National Automatic Tool Co., Richmond, Ind.
United States Drill Head Co., 1948 W. 6th St., Cincinnati.
- DRILLING MACHINES, BENCH**
Ames Co., B. C., Waltham, Mass.
Avey Drilling Machine Co., Cincinnati.
Barnes Co., W. F. & John, 231 Ruby St., Rockford, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Burke Mch. Tool Co., 516 Sandusky St., Conneaut, Ohio.
Canedy-Otto Mfg. Co., Chicago Heights, Ill.
Cincinnati Electrical Tool Co., Cincinnati.
High Speed Hammer Co., Inc., Rochester, N. Y.
Kingsbury Mch. Co., Keene, N. H.
Langelier Mfg. Co., Arlington, Cranston, R. I.
- LeBlond, R. K., Machine Tool Co., Cincinnati.
Leland-Gifford Co., Worcester, Mass.
Millholland Sales & Engineering Co., Indianapolis, Ind.
Muehlhaff, Adolph, Cincinnati, Ohio.
National Automatic Tool Co., Richmond, Ind.
Rockford Drilling Machine Co., Rockford, Ill.
Sigourney Tool Co., 11 Sigourney St., Hartford, Conn.
Standard Electrical Tool Co., 1926 W. 8th St., Cincinnati, Ohio.
Wisconsin Electric Co., Racine, Wis.
- DRILLING MACHINES, BOILER**
Cincinnati-Bickford Tool Co., Oakley, Cincinnati.
Foot-Burt Co., Cleveland.
Niles-Bement-Pond Co., 111 Broadway, New York.
Sellers & Co., Inc., Wm., Philadelphia.
- DRILLING MACHINES, GANG**
Avey Drilling Machine Co., Cincinnati.
Baker Bros., Inc., Toledo, O.
Barnes Co., W. F. & John, 231 Ruby St., Rockford, Ill.
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Cincinnati-Bickford Tool Co., Oakley, Cincinnati.
Colburn Machine Tool Co., Rochester, N. Y.
Consolidated Machine Tool Corp., Rochester, N. Y.
Foot-Burt Co., Cleveland.
Fosdick Mch. Tool Co., Cincinnati.
Hoefler Mfg. Co., Freeport, Ill.
Ingersoll Milling Machine Co., Rockford, Ill.
Kingsbury Mfg. Co., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.
Langelier Mfg. Co., Arlington, Cranston, R. I.
Millholland Sales & Engineering Co., Indianapolis, Ind.
Moline Tool Co., Moline, Ill.
Niles-Bement-Pond Co., 111 Broadway, New York.
Oesterlein Mch. Co., Cincinnati, O.
Rockford Drilling Mch. Co., Rockford, Ill.
Rockford Mch. Tool Co., 2400 Kishwaukee Rd., Rockford, Ill.
Sigourney Tool Co., 11 Sigourney St., Hartford, Conn.
- DRILLING MACHINES, HORIZONTAL, DUPLEX**
Avey Drilling Machine Co., Cincinnati.
Barnes Co., W. F. & John, 231 Ruby St., Rockford, Ill.
Buhr Machine Tool Co., Ann Arbor, Mich.
Kingsbury Mch. Co., Keene, N. H.
Langelier Mfg. Co., Arlington, Cranston, R. I.
Millholland Sales & Engineering Co., Indianapolis, Ind.
Muehlhaff, Adolph, Cincinnati, Ohio.
Murchey Mch. & Tool Co., 34 Porter St., Detroit, Mich.
Rockford Drilling Machine Co., Rockford, Ill.
- DRILLING MACHINES, MULTIPLE SPINDLE, HORIZONTAL**
Buhr Machine Tool Co., Ann Arbor, Mich.
Detroit Machine Tool Co., Detroit.
Greenlee Bros. & Co., Rockford, Ill.
Harrington Co., Philadelphia, Pa.
Hoefler Mfg. Co., Freeport, Ill.
Ingersoll Milling Mch. Co., Rockford, Ill.
Kingsbury Mch. Co., Keene, N. H.
Langelier Mfg. Co., Arlington, Cranston, R. I.
Millholland Sales & Engineering Co., Indianapolis, Ind.
Moline Tool Co., Moline, Ill.
National Automatic Tool Co., Richmond, Ind.
United States Drill Head Co., 1948 W. 6th St., Cincinnati.
- DRILLING MACHINES, MULTIPLE SPINDLE, TURRET**
Kingsbury Mch. Co., Keene, N. H.
Langelier Mfg. Co., Arlington, Cranston, R. I.
- DRILLING MACHINES, MULTIPLE SPINDLE, VERTICAL**
Avey Drilling Mch. Co., Cincinnati.
Baker Bros., Inc., Toledo, O.
Barnes Co., W. F. & John, 231 Ruby St., Rockford, Ill.
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Buhr Machine Tool Co., Ann Arbor, Mich.
Cincinnati-Bickford Tool Co., Oakley, Cincinnati.
Colburn Machine Tool Co., Rochester, N. Y.
Consolidated Machine Tool Corp., Rochester, N. Y.
Foot-Burt Co., Cleveland.
Fosdick Mch. Tool Co., Cincinnati.
Hoefler Mfg. Co., Freeport, Ill.
Ingersoll Milling Machine Co., Rockford, Ill.
Kingsbury Mch. Co., Keene, N. H.
Langelier Mfg. Co., Arlington, Cranston, R. I.
Leland-Gifford Co., Worcester, Mass.
Merit Oil Equipment Co., Cleveland, Ohio.
Millholland Sales & Engineering Co., Indianapolis, Ind.
Minster Mch. Co., Minster, Ohio.
Moline Tool Co., Moline, Ill.
Niles-Bement-Pond Co., 111 Broadway, New York.
Oesterlein Mch. Co., Cincinnati, O.
Rockford Drilling Machine Co., Rockford, Ill.
- DRILLING MACHINES, WALL RADIAL**
Canedy-Otto Mfg. Co., Chicago Heights, Ill.
Hanna Engineering Works, 1763 Elston Ave., Chicago.
Wickes Bros., Saginaw, Mich.
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Cleveland Twist Drill Co., Cleveland.
Cogsdill Mfg. Co., Detroit.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
- Rockford Mch. Tool Co., 2400 Kishwaukee Rd., Rockford, Ill.
Sellers & Co., Inc., Wm., Philadelphia.
United States Drill Head Co., 1948 W. 6th St., Cincinnati.
- DRILLING MACHINES, RADIAL**
American Tool Works Co., Cincinnati.
Barnes Co., W. F. & John, 231 Ruby St., Rockford, Ill.
Canedy-Otto Mfg. Co., Chicago Heights, Ill.
Carlton Machine Tool Co., Cincinnati, Ohio.
Cincinnati-Bickford Tool Co., Oakley, Cincinnati.
Cincinnati Electrical Tool Co., Cincinnati.
Drees Machine Tool Co., Cincinnati.
Fosdick Machine Tool Co., Cincinnati.
Gidding & Lewis Mch. Tool Co., Fond-du-lac, Wis.
Morris Machine Tool Co., Cincinnati.
Niles-Bement-Pond Co., 111 Broadway, New York.
Reed-Prentice Corp., Worcester, Mass.
Ryerson & Son, Joseph T., 2558 W. 16th St., Chicago.
Sellers & Co., Inc., Wm., Philadelphia.
Taylor & Fenn Co., Hartford, Conn.
Western Mch. Tool Works, Holland, Mich.
- DRILLING MACHINES, RAIL**
Baker Bros., Inc., Toledo, O.
Colburn Machine Tool Co., Rochester, N. Y.
Consolidated Machine Tool Corp., Rochester, N. Y.
Defiance Machine Co., Defiance, O.
Foot-Burt Co., Cleveland.
General Electric Co., Schenectady, N. Y.
Harrington Co., Philadelphia, Pa.
Moline Tool Co., Moline, Ill.
Newton Machine Tool Works, Inc., Rochester, N. Y.
Niles-Bement-Pond Co., 111 Broadway, New York.
Sellers & Co., Inc., Wm., Philadelphia.
- DRILLING MACHINES, SENSITIVE**
Avey Drilling Mch. Co., Cincinnati.
Barnes Co., W. F. & John, 231 Ruby St., Rockford, Ill.
Burke Mch. Tool Co., 516 Sandusky St., Conneaut, Ohio.
Canedy-Otto Mfg. Co., Chicago Heights, Ill.
Edlund Machinery Co., Inc., Cortland, N. Y.
Foot-Burt Co., Cleveland.
Fosdick Mch. Tool Co., Cincinnati.
High Speed Hammer Co., Inc., Rochester, N. Y.
Kingsbury Mch. Co., Keene, N. H.
Langelier Mfg. Co., Arlington, Cranston, R. I.
Leland-Gifford Co., Worcester, Mass.
Manufacturers' Consulting Engineers, Syracuse, N. Y.
Merit Oil Equipment Co., Cleveland, Ohio.
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Foot-Burt Co., Cleveland.
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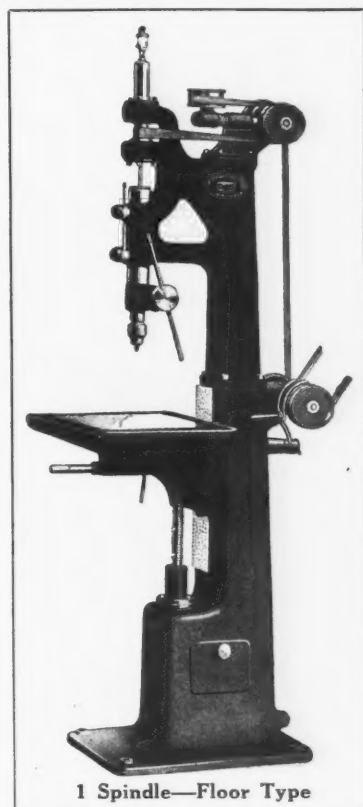
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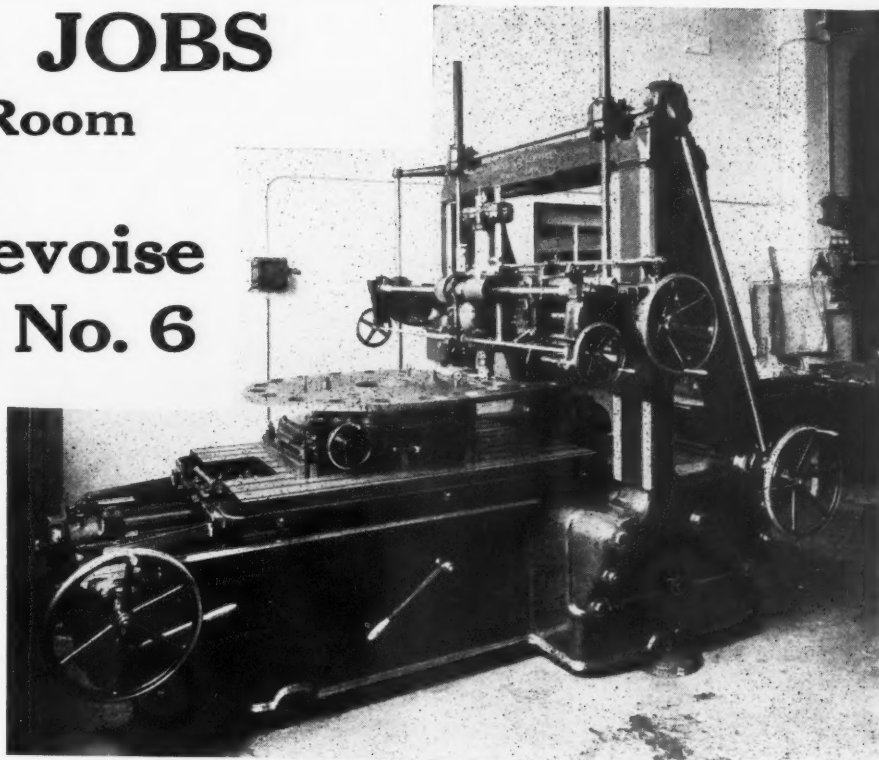
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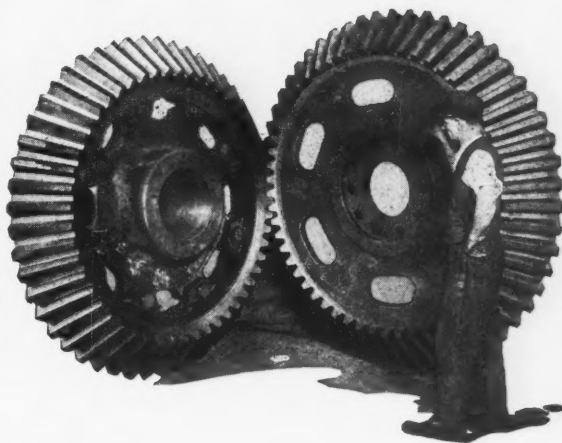
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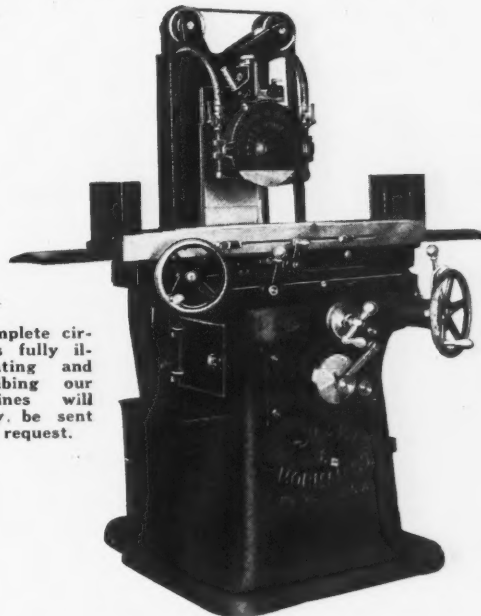
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Barnes Drill Co., 814 Chestnut St., Rockford, Ill.

Betts Machine Co., Rochester, N. Y.

Bradford Mch. Tool Co., Cincinnati.

Cincinnati Lathe & Tool Co., Oakley, Cincinnati.

Consolidated Machine Tool Corp., Rochester, N. Y.

Flather Co., Nashua, N. H.

Gisholt Machine Co., 1300 E. Washington Ave., Madison, Wis.

Hardinge Bros., Inc., 4149 Ravenswood Ave., Chicago, Ill.

Hendey Mch. Co., Torrington, Conn.

LeBlond Machine Tool Co., R. K., Cincinnati.

Lehmann Mch. Co., St. Louis, Mo.

Lodge & Shipley Mch. Tool Co., Cincinnati.

Monarch Machine Tool Co., 209 Oak St., Sidney, O.

Mueller Machine Tool Co., Cincinnati.

Mueller Mch. Tool Co., Cincinnati.

Niles-Bement-Pond Co., 111 Broadway, New York.

Porter-Cable Machine Co., Syracuse, N. Y.

Pratt & Whitney Co., Hartford, Conn.

Reed-Prentice Corp., Worcester, Mass.

Ryerson & Son, Joseph T., 2558 W. 16th St., Chicago, Ill.

Seneca Falls Machine Co., Seneca Falls, N. Y.

Sidney Machine Tool Co., Sidney, O.

South Bend Lathe Works, Inc., South Bend, Ind.

Springfield Machine Tool Co., 631 Southern Ave., Springfield, O.

Sundstrand Machine Tool Co., Rockford, Ill.

Wickes Bros., Saginaw, Mich.

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Barnes Drill Co., 814 Chestnut St., Rockford, Ill.

Harrington Co., Philadelphia, Pa.

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South Bend Lathe Works, Inc., South Bend, Ind.

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Barnes Co., W. F. & John, 231 Ruby St., Rockford, Ill.

Seneca Falls Machine Co., Seneca Falls, N. Y.

LATHES, GUN BORING

Betts Machine Co., Rochester, N. Y.

Consolidated Machine Tool Corp., Rochester, N. Y.

Niles-Bement-Pond Co., 111 Broadway, New York.

Springfield Mch. Tool Co., 631 Southern Ave., Springfield, O.

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South Bend Lathe Works, Inc., South Bend, Ind.

LATHES, PULLEY

Avey Drilling Mch. Co., Cincinnati.

LATHES, SPEED

Diamond Machine Co., Providence, R. I.

Greenfield Tap & Die Corp., Greenfield, Mass.

LATHES, SPINNING

Adriance Machine Co., Inc., 78 Richards St., Brooklyn, N. Y.

Bliss Co., E. W. Brooklyn, N. Y.

Toledo Mch. & Tool Co., Toledo, O.

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Acme Machine Tool Co., Cincinnati.

Bardons & Oliver, Cleveland.

Betts Machine Co., Rochester, N. Y.

Bullard Machine Tool Co., Bridgeport, Conn.

Consolidated Machine Tool Corp., Rochester, N. Y.

Dresses Machine Tool Co., Cincinnati.

Foster Machine Co., Elkhart, Ind.

Gisholt Machine Co., 1300 E. Washington Ave., Madison, Wis.

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International Mch. Tool Co., Indianapolis, Ind.

Jones & Lamson Machine Co., Springfield, Vt.

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Lodge & Shipley Mch. Tool Co., Cincinnati.

Morris Mch. Tool Co., Cincinnati.

New Britain Machine Co., New Britain, Conn.

Pratt & Whitney Co., Hartford, Conn.

Rivett Lathe & Grinder Corp., Brighton, Boston.

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Universal Boring Machine Co., Hudson, Mass.

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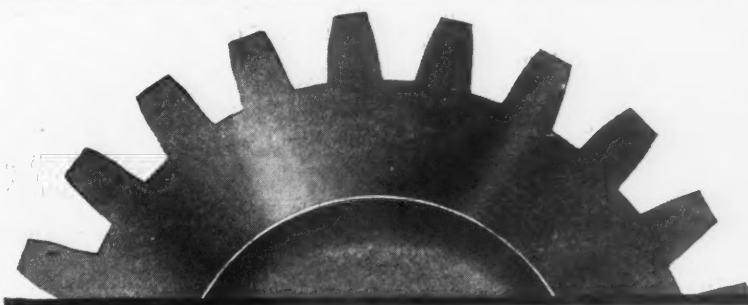
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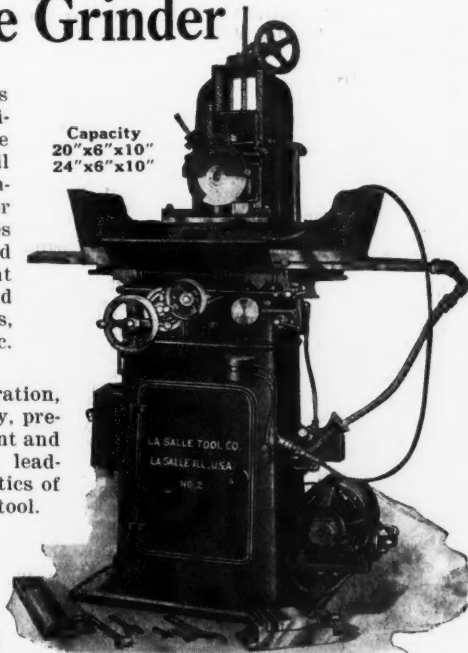
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tucket, R. I.
Pratt & Whitney Co., Hartford, Conn.

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Kent-Owens Machine Co., Toledo, O.
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United States Machine Tool Co., Cin-
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Hendey Mch. Co., Torrington, Conn.

Ingersoll Milling Machine Co., Rock-
ford, Ill.

Kearney & Trecker Corp., Milwaukee,
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McCroskey Tool Corp., Meadville, Pa.

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Newton Machine Tool Works, Inc.,
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Murphy Mch. & Tool Co., 34 Porter
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Besly & Co., Charles H., 120-B No.
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Boston Gear Works Sales Co., Norfolk
Downs, Quincy, Mass.

Bowen Products Corp., Auburn, N. Y.

Gits Bros. Mfg. Co., 1911 S. Kilbourne
Ave., Chicago, Ill.

Tucker, W. W. & C. F., Hartford,
Conn.

OILERS
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Madison-Kipp Corp., Madison, Wis.

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Cincinnati Planer Co., Cincinnati.

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Consolidated Machine Tool Corp.,
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Atlas Press Co., Kalamazoo, Mich.

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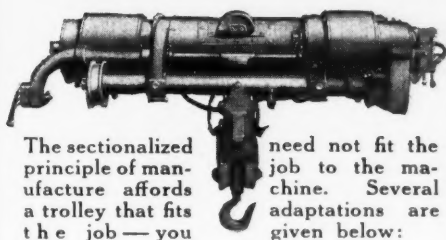
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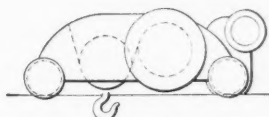


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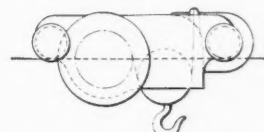


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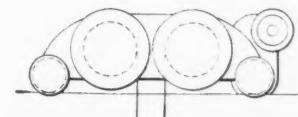
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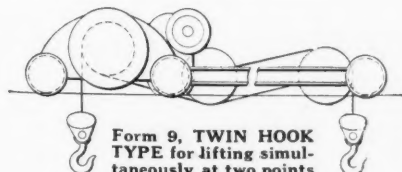
Form 10, CLOSE CLEARANCE TYPE for operation in limited space above crane runway.



Form 6-23, CLOSE LIFT TYPE. Note close lift of hook to girder.



Form 28, GRAB BUCKET TYPE two hoisting units, for grab bucket.



Form 9, TWIN HOOK TYPE for lifting simultaneously at two points long loads parallel to Crane Girders.

ALL parts of the Compact Crane have been given the most rugged details, which together with the use of steel throughout and the all-around compact construction assure strength and resistance to strains without the burden of excessive weight.

This saves money—in lighter building and runway construction, reduced power for all travel motions, livelier performance and more work performed without overworking the crane either mechanically or electrically.

Required headroom is less, load hook can be moved nearer to end and side walls, thus permitting higher stacking, and making accessible a larger floor area. Furthermore, standardized manufacture and sectionalized trolley design enable lower crane manufacturing costs, making possible a truly low selling price—without sacrifice in quality.

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380 Schuyler Ave., Montour Falls, N. Y.

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 Morse Twist Drill & Mch. Co., New Bedford, Mass.
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 Ryerson & Son, Joseph T., 2558 W. 16th St., Chicago, Ill.

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 Watson-Stillman Co., 73 West St., New York City.
 Wickes Bros., Saginaw, Mich.

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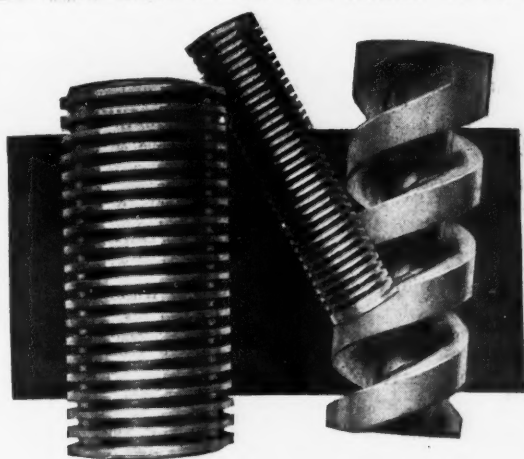
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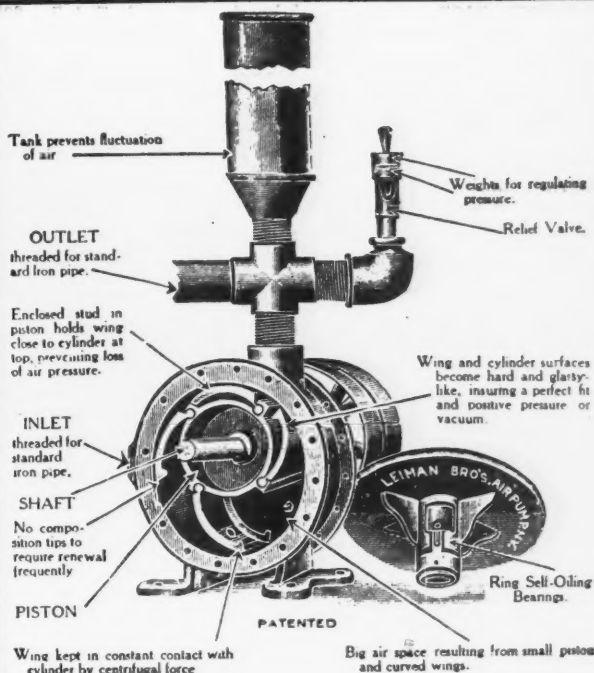
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Miles Mch. Co., Saginaw, Mich.
Morey & Co., Inc., 404 Broome St., New York City.

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Osborne & Sexton Mch. Co., Columbus, O.

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Rand, J. J., Co., Cincinnati, Ohio.

Reliance Machinery Sales Co., Pittsburg, Pa.

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Scott-Bansbach Mch. Co., 130 South Clinton St., Chicago, Ill.

Simmons Mch. Tool Corp., Albany, N. Y.

Stocker-Rumely-Wachs Co., 117-121 N. Jefferson St., Chicago, Ill.

Wayne Mch. Co., Fort Wayne, Ind.

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Magnetic Mfg. Co., Milwaukee, Wis.

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Strand & Co., N. A., 5001 N. Lincoln St., Chicago.

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Cincinnati Shaper Co., Cincinnati.

Gould & Eberhardt, Newark, N. J.

Hendler Mch. Co., Torrington, Conn.

Kelly Co., R. A., Xenia, O.

Morton Mfg. Co., Muskegon Heights, Mich.

Niles-Bement-Pond Co., 111 Broadway, New York.

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Potter & Johnston Machine Co., Pawtucket, R. I.

Rhodes Mfg. Co., Hartford, Conn.

Rockford Mch. Tool Co., 2400 Kishwaukee Rd., Rockford, Ill.

Smith & Mills Co., Cincinnati.

Springfield Mch. Tool Co., 631 Southern Ave., Springfield, O.

Western Mch. Tool Co., Holland, Mich.

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Morton Mfg. Co., Muskegon Heights, Mich.

SHAPERS, PORTABLE

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Hanson-Whitney Machine Co., Hartford, Conn.

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Rhodes Mfg. Co., Hartford, Conn.

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Standard Tool Co., Cleveland.

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Newton Machine Tool Works, Inc., Rochester, N. Y.

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Rhodes Mfg. Co., Hartford, Conn.

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National Twist Drill & Tool Co., Detroit, Mich.

Pratt & Whitney Co., Hartford, Conn.

Standard Tool Co., Cleveland.

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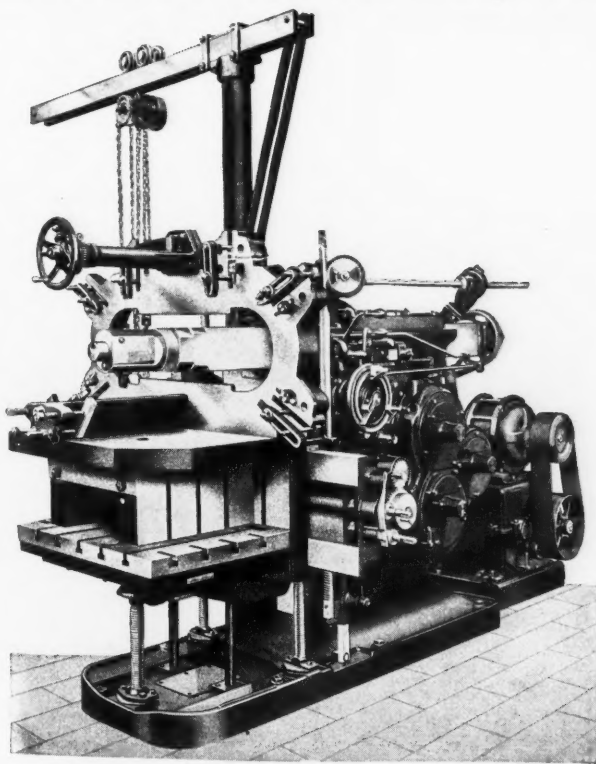
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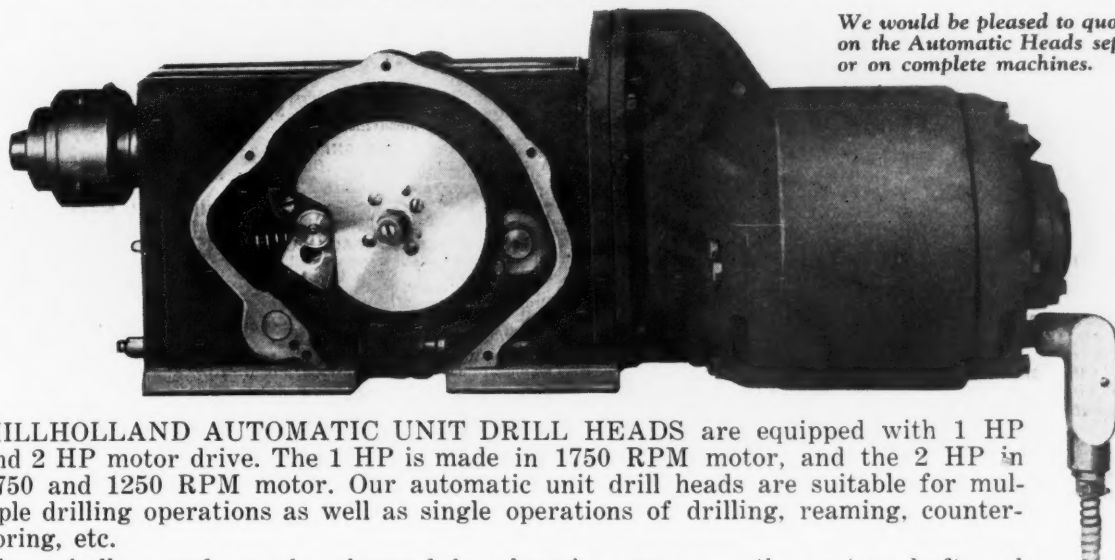
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 Jones Foundry & Mch. Co., W. A., 4409 Roosevelt Rd., Chicago.
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 Geometric Tool Co., New Haven, Conn.
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 Pratt & Whitney Co., Hartford, Conn.
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 Cox & Sons Co., Bridgeport, N. J.
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 Ryerson & Son, Joseph T., 2558 W. 16th St., Chicago, Ill.
 Simonds Saw & Steel Co., Fitchburg, Mass.
 Vanadium-Alloys Steel Co., Latrobe, Pa.
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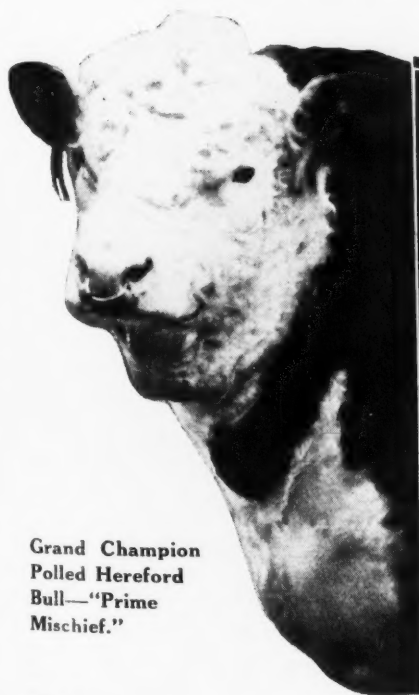
The spindle speed can be changed by changing gears on the motor shaft and spindle drive; the rate of feed may be changed by changing two feed gears; and the depth of drilling may be changed by using different cams.

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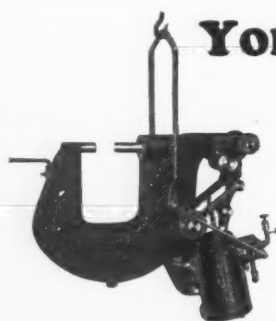
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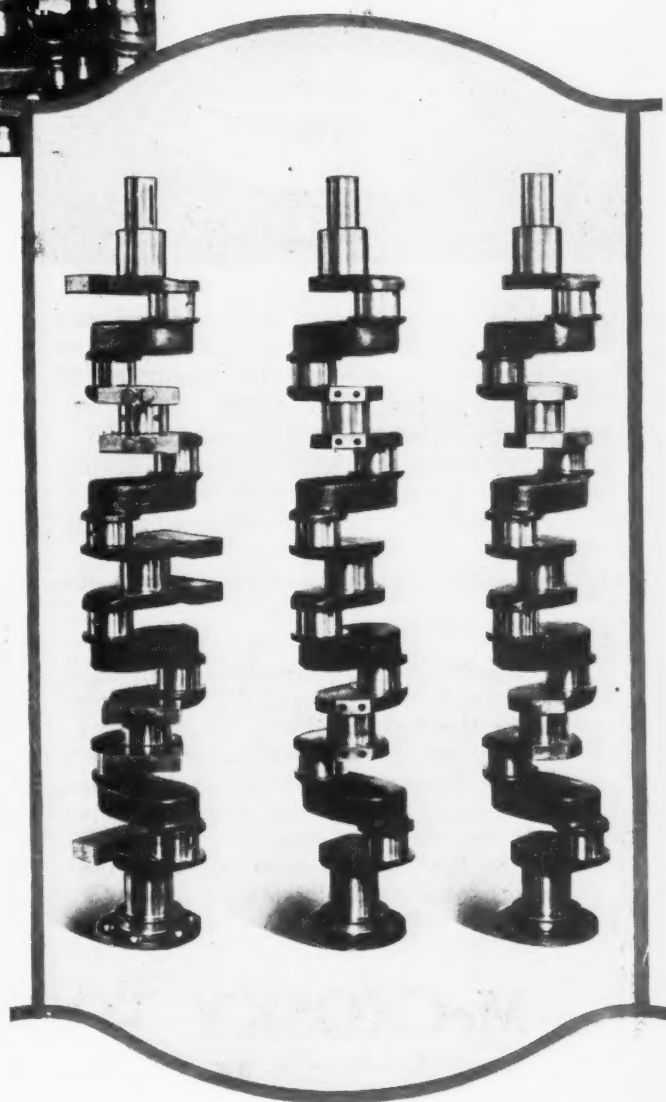
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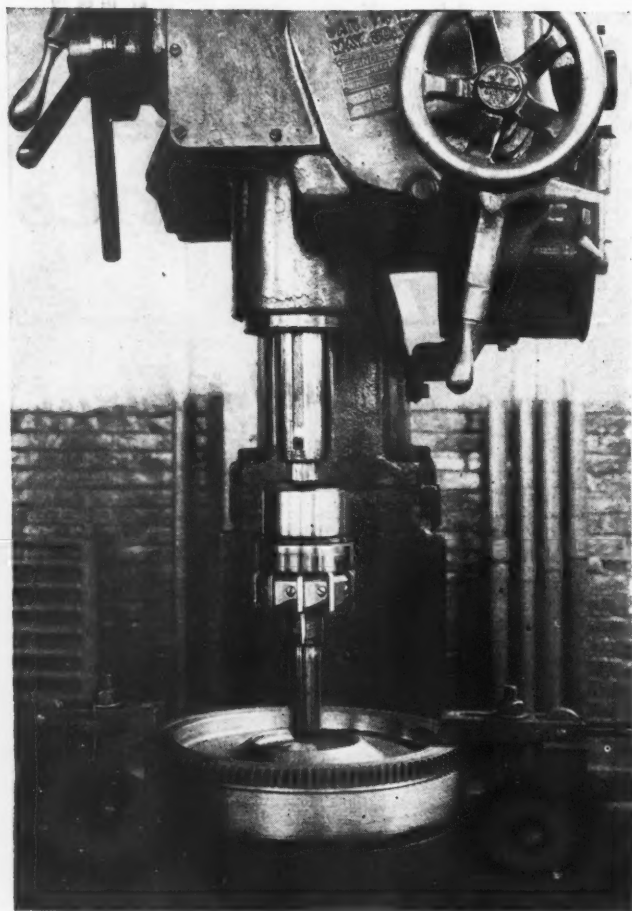
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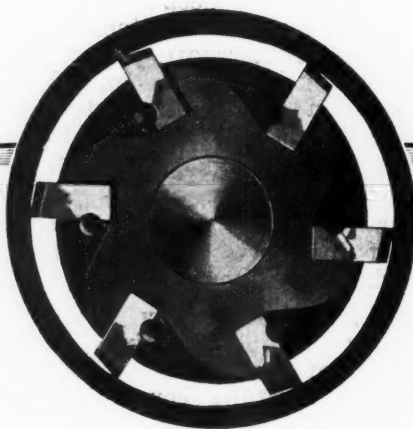


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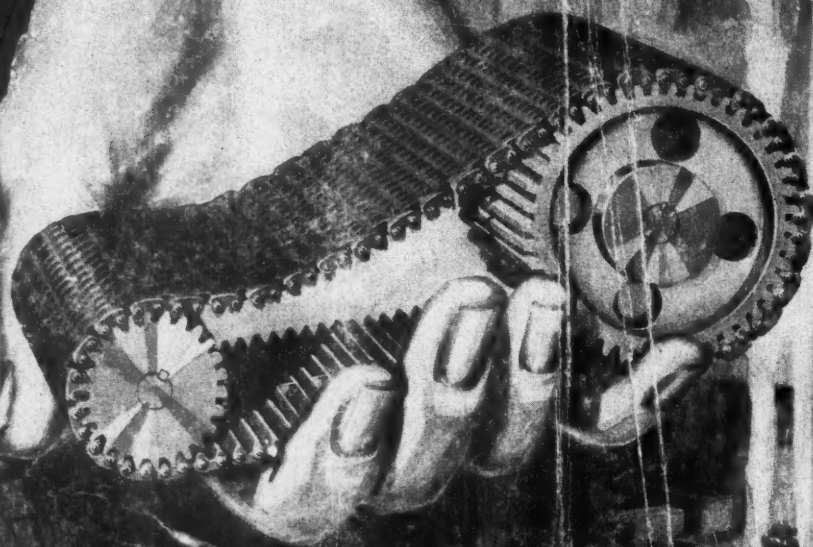
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